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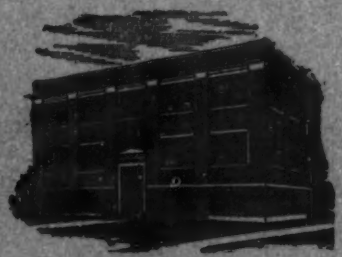

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Fig. 39. Fig. 40. Fig. 41. Fig. 42.

Case 25.

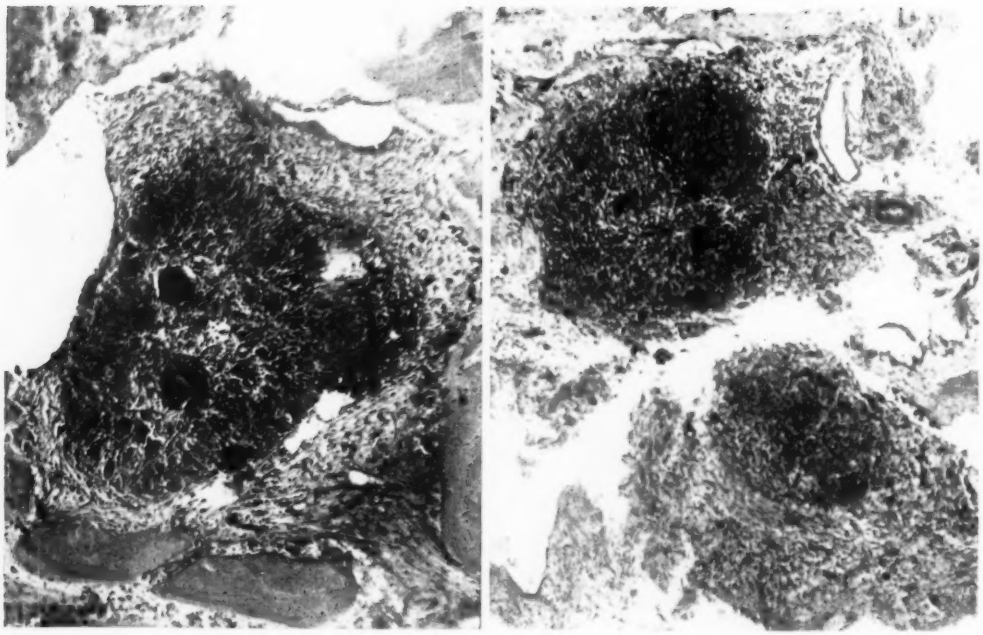

Fig. 43. Fig. 44.

Case 25.

(Roentgenographic Appearance, Diagnosis, and Pathology of Some Obscure Cases of Bone Lesions — Robert W. Lovett and S. B. Wolbach.)

SURGERY, GYNECOLOGY AND OBSTETRICS

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ROENTGENOGRAPHIC APPEARANCE, DIAGNOSIS, AND PATHOLOGY OF SOME OBSCURE CASES OF BONE LESIONS[1]

BY ROBERT W. LOVETT, M.D., AND S. B. WOLBACH, M.D., BOSTON

The publication of this work has been made possible by the Helen Hallett Thompson Fund for Research

FOR the past five years the writers have been concerned in a conjoined study of certain obscure bone lesions, occurring in the orthopedic service of the Children's Hospital. In cases where the diagnosis of a bone lesion was in doubt, the pathologist has been present when operations were to be performed, and has taken his own specimen when the bone was opened, so that if possible an immediate diagnosis could be made by frozen section, and the operative wound treated accordingly. When the pathologist could not make a diagnosis in this way, the specimen was taken to the laboratory, studied, and reported on later.

The cases presented are those in which there was, in the minds of the writers, doubt as to the correct diagnosis from the X-ray and other data available before operation. Each case will be presented with a short clinical history, an X-ray, and a pathological report.

The writers are indebted to Percy Brown, radiologist of the Children's Hospital, for co-operation in the study, and to John J. Morton, of Boston, also a hospital associate, for much labor in the collection and arrangement of the data.

Considering the behavior of bone in general, as studied by the X-ray, it seems to be a structure of very limited reaction to pathological conditions. Regarded from this point of view, there seem to be only three reactions possible in bone. These are: (1) atrophy or diminution in lime content; (2) destruction of bone tissue, local or general; (3) a formative process, characterized by formation of new bone, or a condensation of existing bone around a focus of disease.

The general point of view with regard to these processes has been that tuberculosis is largely destructive in character; that the destructive action is, as a rule, general; that tuberculosis is characterized by marked atrophy of the affected bone, with perhaps atrophy of contiguous bones in the same limb; and that it occurs in the region of the epiphysis.

Osteomyelitis has been generally regarded as a process at first destructive in character, and then formative, the formative process generally becoming dominant.

Syphilis has been considered as the most purely formative of the three processes, with some element of destruction, but much more formative than either of the others mentioned.

When the writers attempted to study, from the point of view of pathological findings, X-rays taken of cases prior to operation, it became evident that this criterion could not be depended upon; that tuberculosis, which has ordinarily been spoken of as occurring in the articular ends of bones, might occur in the shaft, and that it might be almost a purely formative process, or that the formative

[1] From the Orthopedic Clinic of the Children's Hospital and the Department of Pathology of the Harvard Medical School.

Fig. 1, Case 1.

process might exist with the destructive process, and ultimately become dominant; and that a local destructive process, indistinguishable from the so-called Brodie's abscess, might occur in a pure tuberculosis, so that a localized cavity in bone, well walled off, might occur in this disease. It appeared also that a wedge-shaped destruction in the articular end of the bone, with the base of the wedge toward the joint, might occur both in tuberculosis and osteomyelitis, and that under these circumstances the two were practically indistinguishable. The errors in diagnosis, in the experience of the writers, have more often consisted in mistaking tuberculosis for other things than in mistaking other things for tuberculosis. A curious punched out lesion of the skull was identified pathologically in two cases as being definitely tuberculosis. The other confusion which was most troublesome arose between osteomyelitis and syphilis, two cases involving the lower end of the fibula being shown which will be seen to be in X-ray appearances practically identical. Again, the stage of repair in osteomyelitis may be seen in the X-ray of two tibæ to be very similar in syphilis and osteomyelitis.

As it has appeared to the writers, the problem of differentiating the three conditions mentioned by means of the X-ray, is not encountered, as a rule, in the routine case in which a purely destructive lesion is most often tuberculosis. The lesion of rapid destruction, with marked formative activity, is generally osteomyelitis, and the purely formative process is most likely to be syphilis. The serious problem of differential diagnosis occurs most often in cases in which focal lesions are present, in which the phenomena of formative and destructive activity have become so mixed that without the pathological examination, in many of them, the diagnosis is impossible. The advantage of such a diagnosis made during the operation is evident to any surgeon, because it guides him in the treatment of the bone cavity, and is often the direct factor in deciding whether or not to close such a cavity.

In addition to the three conditions of tuberculosis, osteomyelitis, and syphilis, certain other bone lesions are shown, which have a bearing on the question of diagnosis.

A short summary of the case histories will be presented, the salient pathological facts discussed, and conclusions drawn as warranted.

Case 1. Tuberculosis. J. Z., age 3½ years, first seen in the out-patient department of the Children's Hospital on July 30, 1913. Complaint: swelling of ankle; pain at times; lameness.

Examination showed the right ankle swollen, fluctuant, with limited motion. X-ray examination revealed a large area of absorption at the lower end of the tibia, extending part way through the epiphyseal cartilage (Fig. 1, Case 1). A plaster cast applied August 2, 1913. February, 1914, the patient was admitted to the Children's Hospital.

The family and past history negative.

Present illness. The symptoms have been present for 2 years, history indefinite. The child could not walk and had pain and swelling of the right ankle.

Examination. The child was normal except for the local condition, a swelling of the right leg from the ankle-joint to just above the middle. The swelling is globular, not tender, not reddened. One inch above, and slightly external to the external malleolus, there is the remains of an old sinus which has now closed. There is marked limitation in the movement of the ankle-joint. The reflexes are normal. There is one-half inch lengthening of the right leg.

Fig. 2.

Fig. 3.

Case 2.

Operation, February 21, 1914, by Dr. Lovett. Through an incision a piece of cortex was removed and sent for frozen section examination. The cavity of the bone was explored and much caseous material discovered and curetted.

Pathological report. Tuberculosis.

CASE 2. Tuberculosis. N. G., age 5 years, admitted to the Children's Hospital November 15, 1916. The family and past history is unimportant.

Present illness. The patient fell on the ice one year ago injuring the left ankle. The ankle has been swollen and painful and tender to pressure. There have been no night cries, and no loss of flesh.

Examination. There is slight adenopathy in the groins and the neck. A healed ulcer is seen over the head of the left radius; two healed ulcers over the lower end of the right femur on the lateral surface; two over the medial surface of the right calf; one over the left thigh, lateral aspect. The left ankle is limited in motion in dorsi and plantar position, and there is slight lateral mobility. There are two scars in front of the external malleolus and a discharging sinus in the space between the external malleolus and the tendo achillis.

The temperature on admission was 99°. The patient has an evening rise of temperature to 99.5 and 100°. The pulse averages 90. White blood corpuscles 9200. The urine is normal; von Pirquet positive in 18 hours; Wassermann not done.

X-ray examination shows a destructive process at the lower end of the tibia extending close to the epiphyseal line; marked bone atrophy, and no periosteal reaction (Figs. 2 and 3, Case 2.)

On November 23, 1916, the leg was put in a plaster cast.

Operation December 1, 1916, by Dr. Thorndike. The cavity in the tibia was curetted and snippings handed to Dr. Wolbach for diagnosis. One of the superficial skin ulcers on the right thigh was excised for microscopic examination.

On December 7, 1916, the patient was discharged to Wellesley, in plaster.

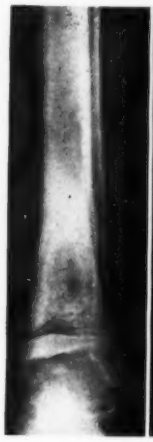

Fig. 4.

Fig. 5.

Case 3.

Pathological report, December 7, 1916, by Dr. Wolbach. Tuberculosis of the skin. Tuberculosis of bone.

CASE 3. Osteomyelitis. H. K., age 10 years, admitted to the Children's Hospital, January 6, 1917. The family history is negative. The patient had measles at 3, whooping cough at 4.

Present illness. Two weeks ago the child had pain in the leg and couldn't walk for about a week. The left leg has been swollen and red. Two days ago it was better and the patient was up and around. Yesterday it was worse, and he suffered much pain, and there was much swelling and redness.

Examination was negative except for local condition. The left ankle-joint was red, painful, and swollen. No motion permitted. The foot was held in 30 degrees plantar flexion. There was fluctuation posterior to both malleoli. Pressure causes pain. The von Pirquet was negative in 48 hours, negative in 60 hours; the bovine test was positive in 36 hours. The urine was normal. White blood corpuscles numbered 17,800.

X-ray examination discloses a destructive process of the lower end of the tibia extending through the epiphyseal line. There is no thickening of the bone (Figs. 4 and 5. Case 3).

Operation, January 24, 1917, by Dr. Lovett. Sequestrotomy. On February, 1917, the patient was discharged to Wellesley, in bivalved cast.

Pathological report, Dr. Wolbach. Granulations and cicatricial tissue from medulla of bone.

CASE 4. Osteomyelitis. E. R., age 10, seen first in the Out-Patient Department of the Children's Hospital, July 18, 1916, at which time the patient complained of pain in right leg. The pain had been worse at night for one year. The patient was admitted to the hospital, January 16, 1917.

Fig. 6.

Fig. 7.

Case 4.

The father died of tuberculosis. One brother is suspected of having tuberculosis of the knee. Otherwise the family history is negative.

The patient had whooping cough 4 years ago, mumps 4 years ago, measles 2 years ago, abscesses on neck 7 years ago, tonsils removed 1 year ago.

Present illness. One year and a half ago the patient had pain in the right ankle, diagnosed as rheumatic. The tonsils were removed. During summer of last year he had severe pains in right ankle at night, and night cries. The pain extended to the knee and hip and centered in the ankle. He lost some weight, was tired, and had headaches.

Examination. The patient was normal except for local condition. Over the anterior and lateral surface of the lower one-third of the right tibia, there is a slight swelling which is tender on pressure. There is no redness, local heat, or sense of fluctuation. The bone surface does not feel rough.

The von Pirquet was negative in 12 hours, positive in 24; Wassermann negative. White blood corpuscles 9900. The urine is normal. The patient runs a temperature from normal to 100° with afternoon rises, and a pulse average around 90.

X-ray examination shows an area of absorption at lower third of shaft of fibula with considerable cortical thickening (Figs. 6 and 7, Case 4).

Operation, January 25, 1917. An incision was made and a hole bored into the fibula. This led to a small cavity the size of a pea. A specimen was taken out for diagnosis and the wound closed without drainage. Dr. Wolbach reports chronic inflammatory osteomyelitis. The patient was discharged February 8, 1917, to Wellesley, in plaster cast.

On February 22, 1917, the wounds were healed, and the general condition was excellent.

Pathological report, Dr. Wolbach. The slide is of a small piece of cancellous bone of unusual density, with irregular arrangement of trabeculæ. The interstices contain chiefly loose textured fibrous tissue in which are a few fat cells. There are no acute lesions. Diagnosis: late repair of bone.

CASE 5. Syphilis. F. M., age 5, admitted to the Children's Hospital, October 13, 1917. The maternal grandmother died of tuberculosis of the lungs. The mother had one miscarriage at 3 months, 3 years after birth of the patient. Otherwise the family history is negative. The patient had pneumonia at 3 and general furunculosis during the summer of this year. Otherwise nothing abnormal is found.

Present illness. The trouble began two weeks ago when the patient objected to having the shoe laced tightly. She said she bumped her foot against the bed. She had no limp. The foot gets sore on exer-

Fig. 8.

Fig. 9.

Case 5.

cise. She has been in bed for a week. She has had no fever, and the pain is not worse at night.

Examination. The right cornea has an ulcer. There is crusting of the anterior nares, and induration of the left tonsil. The glands are enlarged on both sides of the neck. The epitrochlears are not enlarged. Knee-jerks are exaggerated. The ankles and lower quarter of both legs are some enlarged. There is a bony thickening of both fibulæ, more marked on the left. There is considerable œdema of tissues over the lower end of left fibula, and questionable fluctuation 2 inches above the external malleolus. There is no tenderness. There is apparent thickening of the anterior border of the left tibia. There is no marked roughening. Th circumferences of the thighs and calves are the same. The circumference of the left ankle is 6.5 inches, and of the right 6 inches. There is slight contraction of the adductor muscles.

White blood corpuscles 11,300. The von Pirquet is slightly positive in 18 hours. The Wassermann is positive. The urine is negative. Temperature as high as 101°, but usually around 99° to 99.5°. Pulse averaged 80.

X-ray examination shows a destructive process involving the lower end of the fibula not extending through the epiphysis, with very little bony thickening (Figs. 8 and 9, Case 5).

October 19. Case thoroughly studied and diagnosticated both by X-ray and positive Wassermann to be that of syphilis of the bone. The patient was started on mercury treatment, and discharged to out-patient department.

July 10, 1918, re-admitted to house. Dr. Soutter, who has been following the case, thinks the processes are increasing. Examination shows hard area about 2 inches in diameter over internal left malleolus.

Operation, July 13, 1918, by Dr. Sever. An incision was made, the periosteum incised, and bone exposed. The periosteum was much thickened. The bone was opened into the medullary cavity, and a small amount of pus evacuated. The cavity was packed with gauze, and the wound closed with drainage.

July 23, 1918, no report has been received from specimen of bone curetted out of fibula.

July 31, the patient was discharged home, in plaster cast.

Fig. 10, Case 6.

CASE 6. Tuberculosis. E. A., age 2 11/12 years, admitted to the Children's Hospital, August 13, 1918. The family and past history is unimportant.

Present illness. Two years ago the patient fell down stairs. The ankle swelled, and has remained swollen ever since. He was unable to walk or sit for several months, then got so he could walk, but limped all the time. One month ago the mother noticed that the ankle was becoming reddened and swollen on the outer side. He has not walked on it since. He wakes frequently at night crying with pain in ankle.

Examination. There were several areas of skin eruption over the left chest and back, consisting of small blisters and serous crusts, surrounded by slightly indurated edges. The right ankle is generally swollen and there is a large fluctuant reddened swelling, the size of a walnut, over the external malleolus, which is tender on pressure. There is local heat present. The motions of the ankle are slightly limited.

Temperature of the up-and-down type. Afternoon rises to 100°. Pulse 110 to 120. The urine is normal. Von Pirquet negative in 48 hours. White blood corpuscles 14,000.

X-ray examination shows destructive lesion of the lower end of the tibia with marked bone atrophy. Part of the epiphysis is destroyed and there is increased density over the ankle-joint (Fig. 10, Case 6).

Fig. 11, Case 7.

Operation, August 16, 1918, by Dr. Lovett. An incision was made over the abscess. A small amount of pus escaped. The abscess connects with the ankle-joint. The outer surface of the astragalus is found eroded. Several small pieces of granulation tissue were taken for immediate diagnosis. Dr. Wolbach examined them and reported tuberculosis. The wound was closed without drainage.

August 15, Dr. White reports skin lesions are impetigo contagiosa. September 5, 1918, discharged home, in plaster cast.

CASE 7. Syphilis. E. D., age 6 2/12 years, admitted to the Children's Hospital, August 12, 1918. The family history is unimportant. The patient was a normal child. He had whooping cough 3 weeks ago, mumps 1 year ago. Fifteen months ago he fell off of a high ice chest. The next day he had pain in the left knee and walked with a limp. The knee showed fluid in the joint (examined at the Children's Hospital January 27, 1917. Advised rest for a week.) On July 7, 1917, X-ray examination showed a focus in the tibia, line of epiphysis, and he was recommended to the hospital. During the last week he has complained of pain in the shin.

Examination. The inguinal glands are enlarged. There is a slight swelling over the upper third of the left leg, more marked local swelling on the inner side one-half inch below the knee-joint. There is tenderness over this area and the upper third of the tibia.

Temperature 99°, with afternoon rises to 100°. Pulse averages 110. The urine is normal. White blood corpuscles 12,000. The von Pirquet test is negative in 48 hours; the Wassermann test is *positive*.

Fig. 12.

Fig. 13.

Case 8.

X-ray examination shows a destructive process in the upper end of the left tibia extending to but not through the epiphyseal line. There is no cortical or periosteal reaction (Fig. 11, Case 7).

Operation, August 16, 1918, by Dr. Lovett. An incision was made over the tibia just below the knee. The periosteum was found to be lifted from the bone for an area of about 1 square inch. An incision was made through the periosteum, opening into a small cavity full of yellow, spongy detritus. Some of this material was taken for immediate diagnosis, and was reported as chronic inflammatory tissue. The wound was closed with drainage.

September 5, 1918, discharged to Wellesley.

Case 8. Tuberculosis. M. H., age 3 11/12 years, admitted to the Children's Hospital, July 5, 1916. The mother has tuberculosis; is living in Mattapan Hospital for tuberculosis. The father and four other children are living and well. The patient is cross eyed. She has had measles and whooping cough. She had impetigo contagiosa on the face, when examined in May, 1914.

Present illness. In May, 1914, had impetigo and was treated in out-patient department. In May, 1915, she had sores on both arms, which had been present for 3 months, breaking down a week before coming to the dispensary. There was no pain and no fever. On the right wrist there was an ulcer which was deep in the tissues, 3 to 4 centimeters in diameter, but not involving the bone. There was a fluctuant tumor of the left elbow. The Wassermann was negative. In June, 1916, there was a large pustular, indurated swelling at the right wrist, which was tender. July, 1916, X-ray showed osteomyelitis of the right radius.

Examination. The child is normal except for the local condition. There are ulcers on the right and left forearm at the elbow and the lower end of the radius. The area about the ulcers is reddened and indurated. The lower end of the right radius is greatly thickened. All the ulcers discharge a thin yellow pus.

Temperature 99° to 100.5°. Pulse 100. The urine is normal. White blood corpuscles 16,800; polymorphonuclears 77 per cent; eosinophiles 1 per cent; large mononuclears 6 per cent; small mononuclears 16 per cent. The von Pirquet is positive in 24 hours. The Wassermann is negative.

X-ray examination shows a loss of substance in the lower third of the radius with considerable cortical thickening and periosteal reaction (Figs. 12 and 13, Case 8).

Operation, July 18, 1916, by Dr. Legg. The radius was opened, and the bone cavity filled with granulation tissue; curetted. The wound was closed with drainage.

Pathological report. The section includes tuberculous granulation tissue and a few necrotic bone trabeculæ. The granulation tissue contains large areas of caseation, portions show considerable fibrosis; so that while progressive the process is not very active.

Case 9. Osteomyelitis. L. W., age 7, admitted to the Children's Hospital, August 15, 1918. The family history is negative. The child suffered a burn on the left shoulder when she was 2 years of age; she had an abscess of the left forearm in August, 1917; and she has had abscesses on the right hand and the left hip. She had measles one and a half months ago.

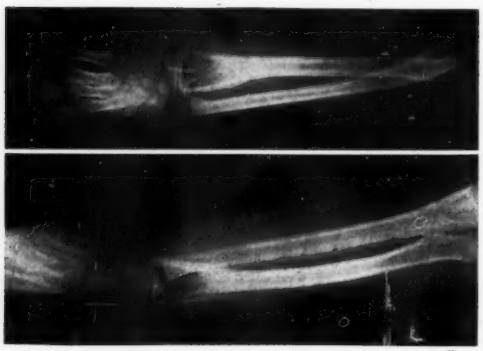

Fig. 14 (above) and Fig 15, Case 9.

Present illness. Ten days ago the left wrist commenced to swell. About five days ago it became very painful, red and hot. The child has not felt very sick.

Examination. There is a scar of an old burn about the left shoulder. There is marked general swelling of the lower half of the left forearm and hand. The skin is shiny, tense, and reddened. There is a marked local heat and marked tenderness over the whole lower half of the forearm. No pitting on pressure. There is a scar 1 inch long on the thumb side of the forearm, just above the wrist. Deep fluctuation is present, and limitation of motion of the wrist. The right hand shows a scar one-half inch long on the extensor surface at the base of the third finger. There is a scar 1 inch long in the left groin.

The temperature was 101° on admission. Pulse 120. There is no record on any special examinations in the history.

X-ray examination shows marked destruction of tissue at lower end of radius with some periosteal juxta-epiphyseal proliferation (Figs. 14 and 15, Case 9).

Operation, August 16, 1918, by Dr. Lovett. An incision was made on dorsal surface on forearm over the lower end of the radius. The bone was exposed. The periosteum was much thickened. The bone was opened and found so soft that it cuts almost like cheese. Considerable pus escaped from the abscess cavity, which was apparently about 1 inch long. The wound was closed with drainage. August 29, the patient was discharged home with very little discomfort.

Pathological diagnosis. Osteomyelitis.

CASE 10. Osteomyelitis. E. B., age 2 9/12 years, admitted to the Children's Hospital, December 9, 1918. The family history is unimportant. The patient had measles one year ago, and an abscess was operated upon outside, September 16, 1918; otherwise the past history is negative.

Present illness. An abscess appeared about a year ago, subsided, came back, and stayed. It was thought to be a cyst and ointment was applied, but the trouble got no better. The patient was operated upon at another hospital, September 16, 1918, and at this time the mother was told that it was probably a tuberculous abscess.

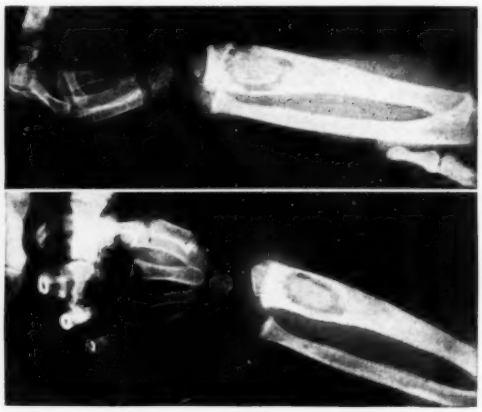

Fig. 16 (below) and Fig. 17, Case 10.

Examination. The cervical glands are enlarged. The left arm is carried in slight pronation. There is a marked swelling at the wrist over the lower end of the radius, with two discharging sinuses. There is a marked thickening of the soft parts over the above area, also a thickening of the lower end of the radius. Scarcely noticeable tenderness is shown.

The temperature was normal on admission, of the up and down type, with rises in the afternoon to 100°. Pulse 80 to 110, following temperature. The von Pirquet was positive in 12 hours. The urine shows a trace of acetone. White blood corpuscles 14,000.

X-ray examination shows a destructive process involving the lower half of the radius, with sequestrum formation (Figs. 16 and 17, Case 10).

Operation, December 17, 1918, by Dr. Legg. The sequestrum was removed. The wound drained.

Pathological report, Dr. Wolbach. The sequestrum shows no evidence of tuberculosis.

January 5, 1919, the patient was discharged in plaster cast, in excellent condition.

CASE 11. Syphilis. M. S., age 11 9/12 years, admitted to the Children's Hospital, March 25, 1919. The family history is negative. The patient had measles, scarlet fever, and whooping cough; otherwise normal.

Present illness. Three years ago there was a swelling of the right wrist; 6 months later there was a large ulceration at the outer side of the left knee. The patient was operated upon in New Hampshire, November 17, and remained in hospital for a month. The knee healed. In July, 1918, the right wrist and also the elbow became swollen and tender. Since operation, in November, 1918, has had to have almost daily dressings.

Fig. 18, Case 11.

Examination. The patient is a poorly nourished, anæmic child, normal except for local trouble. The right forearm is enlarged. At the elbow-joint is an ulcer about 3 inches in diameter, with regular, sharp edges and exuberant granulations, greenish looking and soft. The discharge is not profuse. On the lower third of the forearm on the ulnar side is another ulcer about 2 inches in diameter, freely discharging, gangrenous in the center. Below this ulcer there is a soft, fluctuant, slightly tender swelling. Motions of the elbow-joint markedly limited. Temperature normal. Pulse 80 to 90.

The Wassermann is positive; the von Pirquet negative. The mother's Wassermann is reported positive. White blood corpuscles 9400. The urine normal.

X-ray examination shows considerable destruction and bony overgrowth of both ends of the ulna, with marked periosteal proliferation (Fig. 18, Case 11).

April 3. Antiluetic treatment started. Dr. Wolbach has seen the case and considers it probably gumma. He did not think it would be worth while to look for spirochætæ, but requested snippings of granulations of tissue in 10 per cent formalin to be stained by Levaditi's method.

April 18. Local condition shows moderate improvement.

April 24. The patient was seen in consultation by Dr. Morton Smith and a diagnosis of specific, syphilitic infection made.

May 16. Local condition has cleared up considerably. The patient was given neodiarsenol twice, 150 milligrams each dose.

July 15, 1919. The patient was discharged. Dr. Wolbach reports that the granulation tissue examined April 3 is negative for spirochætæ.

Pathological report by Dr. Wolbach. The material consists of granulation tissue without destructive features. Satisfactorily impregnated blocks by Levaditi's method were negative for spirochætæ.

CASE 12. Bone cyst. M. H., age 7 years, admitted to the Children's Hospital, October 11, 1918. The family history is negative. The patient had whooping cough at 2 years of age, measles at 5, mumps at 5; otherwise nothing abnormal.

Present illness. Two years ago the patient fell and injured his left hip. He could not walk until the next day. Three months after the injury he began to limp and complained of soreness of the left thigh. He had attacks of limping which lasted for a week at a time, and intervals between attacks, during which he had no symptoms whatever. In the last 2 months the condition has become worse, the patient complaining of soreness and tenderness in the left groin. At no times have there been any night cries or swelling. There has been no position of the limb favored by the patient. The general health has been excellent.

Fig. 19, Case 12.

Examination. The findings were negative except for local condition. Local examination shows that the patient walks with a fairly well marked left-sided limp, the trunk being inclined toward the left side. On standing there is a slight lateral deviation of the spine to the left. The left shoulder is below and behind the right. There is no rotation on the posterior aspect of the thigh. There is a very slight fullness at the outer end of the left gluteal fold. There is no perceptible difference in the size of the two legs. The measurements are practically the same. There is a slight thickening just below the great trochanter, posteriorly. There is a limitation of about 10 degrees in flexion and in abduction. The knee-jerks are present, and slightly increased on the left.

The temperature ranged from 101° to 102.4°. The von Pirquet reaction is negative. Wassermann reaction negative.

X-ray examination shows a bone cyst at the upper third of the left femur (Fig. 19, Case 12).

Operation, October 24, 1913, by Dr. Lovett. An incision was made just below the great trochanter of the femur. A hole was made into the marrow cavity, and a piece of bone about one-half inch by three-quarters of an inch, by one-eighth of an inch in thickness was removed from the cortex. With the removal of this bone, there was an escape of thin, blood-stained serum, leaving a cavity two and three-quarters, by one and one-quarter, by one inch. This

Fig. 20, Case 13.

cavity was not lined by any membrane. The walls were hard and smooth. Closure without drainage.

November 19. The patient was sent to Wellesley, in plaster cast. Convalescence uneventful.

Pathological report. Bone cyst.

CASE 13. Chondrosarcoma. E. M., age 5 4/12 years, admitted to the Children's Hospital, September 28, 1915. The family and past history is unimportant.

Present illness. About one year ago the patient began to suffer with pain in the left thigh. The pain was not severe, but described as a slow ache. She would grow tired very easily on the slightest exertion. She had a limp.

Examination. The patient is normal except for local condition. She walks with slight left-sided limp. There is a slight limitation in all external motions of the left hip. There is 3/8 of an inch lengthening of the left leg, and considerable thickening of the upper end of the femur.

The temperature is normal. Pulse about 90. The urine shows slight amount of acetone. The von Pirquet and Wassermann were not done at this time.

X-ray examination shows a punched-out process with areas of absorption involving the upper half of the shaft of the left femur with very little evidence of bone repair (Fig. 20, Case 13).

Operation, September 30, 1915, by Dr. Legg. An incision was made along the femur from the trochanter; the bone opened into the marrow cavity. The marrow was found to be a pearly gray color, and as much of this as possible was curetted out. The wound was closed with a small drain.

Pathological report by Dr. Wolbach. Chondrosarcoma.

October 23, 1915. The patient was discharged in a plaster cast, in good condition.

December, 1915. Re-entry. No change in general condition.

December, 1916. Re-entry. Since December 28, 1915, she has been home in plaster cast, and has been walking on crutches. All last winter she walked without crutches. She has done well until 2 months ago, when she had pain in the knee. She is returning to the hospital on advice of Dr. Legg.

Examination. She walks with left-sided limp. She has one-half inch measured lengthening of the left leg. All the motions of the hip are normal except for slight limitations of hyperextension.

Operation, December 15, 1915, by Dr. Legg. An incision was made along the course of the old scar; dissection carried to the bone, and the whole medulla curetted out. Cartilaginous material was found the whole length of the exposed area. Cigarette drain was inserted and the wound closed.

The Wassermann reaction was reported negative.

Pathological report by Dr. Wolbach. Chondrosarcoma.

CASE 14. Tuberculosis. J. T., age 4 years, admitted to the Children's Hospital, January 31, 1917. The patient's mother died of tuberculosis; otherwise the family history is negative. The past history is negative.

Present illness. Last June the patient suddenly stopped walking on the left leg, and began to crawl on the hands and right leg. This lasted 4 days, when a soft fluctuant tumor, the size of a plum appeared on the left thigh, slowly and persistently increasing in size.

Examination. The patient has a square head, rosary, and rickets of arms and legs. Over the outer side of the left thigh there is a very large tumor, which is fluctuant and discharging pus.

The von Pirquet is positive in 36 hours; the Wassermann negative. Temperature 101°. Pulse 140. The urine is normal. White blood corpuscles 40,000. Mononuclears 10 per cent; polymorphonuclears 90 per cent.

X-ray examination shows (1) destructive process involving the neck of the left femur with fracture of the neck and no periosteal thickening; (2) area of absorption of the right temporal region (Figs. 21 and 22, Case 14).

Operation, February 1, 1917, by Dr. Ladd. Incision and drainage.

February 5, 1917. The patient was transferred to the orthopedic service. Left hip 45 degrees flexion, and slight abduction.

Operation, March 22, 1917, by Dr. Lovett. Drainage of abscesses over the right temporal region.

April 7, 1917. The patient had diphtheria. Discharged to South Department.

May 16, 1917. Readmitted for greatly swollen left thigh, very tender, brawny induration from Poupart's ligament to knee.

Fig. 21, Case 14.

Fig. 22, Case 14.

May 17, 1917. Ether, Dr. Lovett. Incision and drainage. One ounce of pus was evacuated.

The periosteum of the femur was thickened. No sinus to femur was found.

July 5, 1917. The patient was discharged to Wellesley.

Pathological report by Dr. Wolbach. Tuberculosis.

CASE 15.[1] Tuberculosis. J. R., age 20 months, admitted to the Children's Hospital, September 24, 1913. The family history reveals tuberculosis on mother's side; otherwise negative. The patient had rickets in February and March of this year.

Present illness. In March of this year, a swelling appeared on the index finger of the left hand. Since that time numerous nodules have appeared in various parts of the body, sides of left abdominal wall, scalp, etc. One of these nodules has broken down and discharges pus.

Examination. There are two enlargements on the right side of the scalp, one is hard, the other fluctuant. There is moderate enlargement of the glands of the neck. A moderate swelling is present at the outer canthus of each eye with bluing of the skin over this area, and puffiness under the eyes. There is thickening over the left lower jaw. The heart and lungs are normal. The abdomen is normal. There are a few small swollen areas on the surface of both lower extremities, a thickening of the upper portion of the right shin, fusiform enlargement of the first two phalanges of the first finger of the left hand, with slight motion in the joint, swelling elastic to touch, in inner side of dorsum of left foot two prominences, located 2 inches above the right supra-orbital region about 1 centimeter in diameter, red and semi-fluctuant, on dorsum of left foot, there is a slight swelling from the toes to the ankle-joint.

The von Pirquet is positive. Wassermann negative. The urine is normal. White blood corpuscles 15,600, polymorphonuclears, 60 per cent, lymphocytes 40 per cent.

X-ray examination shows: (1) Three punched out holes in the frontal region of the skull with a slight reaction about each. (2) Three areas of absorption at lower end of the left humerus with little evidence of bony reaction; loss of substance in the center of left ulnar shaft with some periosteal reaction; loss of substance in the basal phalanx of the left index finger and considerable thickening of cortical bone about this cavity. (3) There is a cavity in the upper third of the right tibia shaft with considerable cortical thickening about it and marked bone atrophy in rest of the limb (Figs. 23, 24, and and 25, Case 15).

Operation, October 3, 1913. A section of skin over the two superficial abscesses on the thigh was removed. The specimen was sent to the Medical School for examination by Dr. Dyer.

October 21, 1913. The tumor over the right parietal region was aspirated. A piece of cortex was removed from the tibia. Thick yellow pus escaped from the wall of definite abscess. The cavity was closed with drainage. A guinea pig was inoculated with material from the above operation. The child was sent to Wellesley, and readmitted to hospital several times.

October 24, 1914. Discharged to Boston Consumptive Hospital, Mattapan.

Pathological report. There are sections through the skin and granulation tissue from the bone. The skin is essentially normal except for a very heavy diffuse infiltration with lymphoid cells, plasma

[1]Case reported by H. J. Fitz Simmons Boston M. & S. J., clxx. No. 14, 547-550.

Fig. 23.

Fig. 24.

Fig. 25.

Case 15.

cells, polymorphonuclear leucocytes and eosinophiles. The lower layer of the corium, however, presents a typical layer of tuberculous tissue which forms the wall of a cavity with caseous contents. Extending upward into the corium are small tubercles with giant cells. There is on the whole a very thin layer of reaction (i.e. epithelioid cell and giant cells) separating the caseous material from the skin. The granulation tissue contains many small tubercles, many without giant cells or caseation as well—typically formed tubercles. Throughout the tissue is heavily infiltrated with mononuclear (endothelial) leucocytes and polymorphonuclear leucocytes. One border of the granulation tissue is caseous. In this case the process is rapid. In spite of numerous polymorphonuclear leucocytes there is no positive evidence of pyogenic infection, and the whole process is to be interpreted as a rapidly progressing form of tuberculosis.

Case 16. Tuberculosis. F. C., age 3 11/12 years, admitted to the Children's Hospital, October 3, 1917. The family and past history is unimportant.

Present illness. Two weeks ago, without history of injury, the patient began to have right-sided limp. There was no pain or tenderness. Dr. Lovett advised rest in bed. An X-ray taken two weeks ago shows elevation of periosteum, below and behind trochanter of right femur. This morning the patient complained of severe pain in both hips, and both hips were fixed by muscle spasm. In a few hours the pain subsided, and the left hip was freely movable. The right was still held by spasm, and was painful on attempted motion.

Examination. The patient is a well developed and nourished child. The right hip is swollen. There is a general thickening around the joint with tenderness on the inner and posterior aspect of thigh. No fluctuation or areas of special induration are made out. The hip is fixed in 30 degrees flexion by muscle spasm and permits of very little motion on account of pain.

The von Pirquet is slightly positive. The urine is normal. Culture from the hip-joint shows *no growth.* Temperature 99° on admission, and 102.6° the next evening. Pulse 110 to 130.

X-ray examination shows destructive process in the neck of the femur extending through to the epiphysis, with periosteal proliferation (Fig. 26, Case 16).

Operation, October 5, 1917, by Dr. Lovett. An incision was made over the right trochanter and carried deeply into the tissues until the head of the femur could be readily palpable. No pus was found. A small incision was made into the capsule of the joint and 3 drams of turbid fluid escaped. The wound was closed with drainage.

November 6, 1917. The patient was discharged home, in abduction splint.

November 19, 1917. Re-admitted. The condition has been satisfactory until one week ago, at which time he began to lose color and appetite and an afternoon temperature was noticed. Examination at this time shows an acutely ill child, with a small sinus of the right hip, which drains a small amount of seropurulent material. There is no induration or fluctuation about this. White

Fig. 26.

Fig. 27.

Case 16.

blood corpuscles 18,600, polymorphonuclears 78 per cent, mononuclears 22 per cent.

November 27, 1917. The condition is worse, the patient vomits considerably and is drowsy. The urine shows acetone. There is a questionable stiffness in the neck. The knee-jerks are slightly exaggerated. There is an ankle clonus which is not sustained. Lumbar puncture shows a clear fluid, under slight pressure, containing 52 cells, 90 per cent of which are mononuclears.

November 28, 1917. Dr. Morse makes a diagnosis of probable tuberculous meningitis. The child became gradually worse and died on December 3, 1917.

Pathological report by Dr. Wolbach. A specimen taken at the operation, consisting of the upper part of the shaft and head of the femur, was examined and reported tuberculosis (Fig. 27, Case 16).

Case 17. Tuberculosis. R. M., age 5 years, admitted to the Children's Hospital, January 4, 1910. The family history is negative. The patient had measles, whooping cough, and anæmia at 1 year of age, scarlet fever at 2, small pox, but no other history of importance.

Present illness. Three months ago the child had inflammation in the groin after a fall on the right hip, associated with pain and fever. This lasted 8 weeks, during which time he was in bed. After this he walked with a limp. Three weeks ago the upper right forearm showed an area on the inner surface the size of a hen's egg—swollen, hard, very painful on motion. The swelling of the leg increased and became reddened and tender.

Examination. The patient is pale, but is otherwise normal except for local condition. The right femur shows a swelling and induration, extending from the groin to 3 inches above the knee, also thickening about the trochanter. On the right humerus there is an area of redness and induration the size of a small hen's egg. Over the left humerus, there is an area of induration the size of a half dollar.

White blood corpuscles 6,400; differential count—polymorphonuclears 58 per cent, large mononuclears 10 per cent, small mononuclears 26 per cent, eosinophiles 2 per cent. Red blood corpuscles 4,780,000. Hæmoglobin 90 per cent. The urine is normal. Tuberculin reaction not reported. Temperature up and down from normal to 101°. Pulse averaged 110.

X-ray examination shows: (1) Marked destructive process of right femur in upper portion near the trochanter with sequestrum formation and periosteal thickening, also similar process of mid-shaft. (2) Localized destructive processes of mid-shaft of both humeri with marked periosteal proliferation.

Operation, January 14, 1910, by Dr. Lovett. An incision was made over the femur. Two sequestra were removed. The wound was drained. Incision and drainage of abscesses on each of the arms. Holes were found communicating with the inside of the bone in each case.

March 16. The patient was discharged to Wellesley; sinuses still discharging.

June 29. Returns for further treatment.

July 27. Discharged to Wellesley in splint.

Fig. 28.

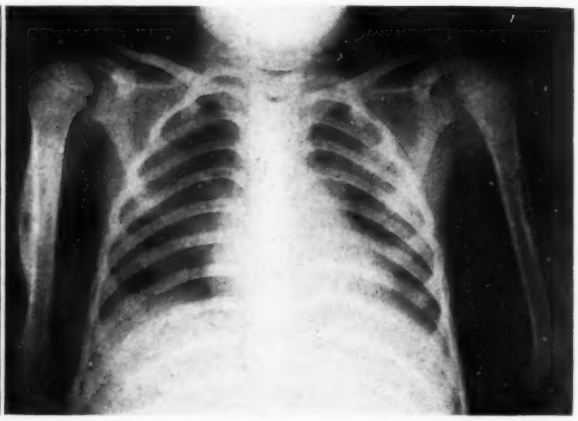

Fig. 29.

Case 17.

March 10, 1911. Readmitted for operation, but improved so much in house that he was discharged to Wellesley.

October 11, 1911. Readmitted to the Hospital, and on October 17, 1911, had an operation by Dr. Thorndike. Removal of sequestrum from femur.

Pathological report by Dr. Wolbach. There are two sections both containing necrotic bone trabeculæ and marrow tissue. In the marrow and at the periphery in areas with bone trabeculæ are perfectly typical miliary tubercles. A few are very early and consist of collections of large cells (epithelioid—endothelial) only, others with giant cells and caseation. Surrounding the remains of the marrow is a diffuse mass of caseous material and tuberculous granulation tissue with necrotic remains of bone tissue. Diagnosis: rapidly progressing tuberculosis of bone (Fig 30, Case 17). Dr. Councilman reported the infection in the specimen of bone removed at the first operation by Dr. Lovett to be tuberculosis.

Fig. 30, Case 17.

Fig. 31, Case 18.

Fig. 32.

Fig. 33.

Case 19.

Case 18. Tuberculosis. C. P., age 4½ years, admitted to the Children's Hospital, November 27, 1916. The family history is negative. The patient had scarlet fever at 4 years; otherwise the past history is negative.

Present illness. The patient began to limp following a fall 5 days ago. She complained of pain in the outer side of the left thigh.

Examination. The patient is normal except local condition. She walks with left-sided limp. The left hip is in place. Abduction is limited to 15 degrees, with 10 degrees permanent flexion. There is slight thickening of the hip. There is tenderness on pressure with slight shortening and atrophy of left leg.

The von Pirquet is positive in 36 hours. The urine is normal. White blood corpuscles 20,900, polymorphonuclears 78 per cent. Mononuclears 22 per cent. The temperature ranges from 99 to 100.5° with afternoon rises. Pulse averages 90. Wassermann not reported.

X-ray examination shows an area of absorption in the trochanter of the left femur, with slight periosteal reaction (Fig. 31, Case 18).

December 13. The patient was put in traction splint.

February 27, 1917. The patient was readmitted to the hospital for operation on the left trochanter.

Operation, March 3, 1917, by Dr. Lovett. An incision was made over the great trochanter. Immediately after going through the subcutaneous tissue one ounce of stringy, purulent material was evacuated. No caseous material was encountered. The upper portion of trochanter has a small opening into the cavity. No sequestrum was present. The wall of the cavity was hard and smooth. The wound was closed with drainage. Examination of the specimen removed at this operation by Dr. Wolbach showed tuberculosis.

Pathological report by Dr. Wolbach. There is a section through the curettings removed at operation. The bulk of the material is necrotic tissue, caseous in appearance. There are small areas of granulation tissue with small caseous foci and giant cells, and occasional definite tubercle formation. The tissue contains no bone. The appearances suggest a rapidly progressive tuberculosis with rapid caseation and little fibroblastic reaction.

Case 19. Osteochondrosarcoma. C. P., age 11½ years, admitted to the Children's Hospital, February 24, 1913. The family history is negative. The patient had measles 8 years ago, whooping cough 7 years ago, diphtheria 6 years ago.

Present illness. While playing football in the fall of 1911, he hurt his right leg, and since then has limped. He has never had any pain. There has been a lump on the leg which has not increased in size. There has been no loss of weight. He eats and sleeps well.

Examination. The patient is normal except for local condition. Just below and anterior to the right trochanter is a swelling about 3 inches in

Fig. 34. Case 20.

diameter, not reddened, but hard and apparently connected with the bone. There is some slight pain on pressure over the middle of the tumor. There is no limitation of motion of the hips. There is no difference in the length of the legs. Circumferences of the calves are the same. The thigh measures 1¾ inches greater over the tumor mass than at a corresponding point on the other thigh. The inguinal glands on the right side are enlarged and a few small glands are felt in the left inguinal region. The patient walks with a limp. The temperature is normal. White blood corpuscles 6,500. The von Pirquet is positive; the Wassermann negative.

X-ray examination shows a destructive process of the upper end of the right femur breaking through the periosteum, extending into the soft tissues (Fig. 32, Case 19).

Operation, March 7, 1913, by Dr. Lovett. A piece of bone was removed from the right femur and sent to Dr. Councilman for diagnosis. The bone cortex was very spongy.

Operation, March 13, by Dr. Lovett. Disarticulation of the femur at the hip-joint.

April 4. The wound is healing nicely. General condition excellent. April 10. Discharged home.

Pathological report. Osteochondrosarcoma (Fig. 33, Case 19).

CASE 20. Sarcoma. H. L., age 4 years, seen in the out-patient department of the Children's Hospital April 26, 1910. The family history is unimportant. The patient had measles 1 year ago, mumps one and one-half years ago; otherwise the past history is unimportant.

Fig. 35, Case 21.

Present illness. A few days ago the patient had trouble with the left hip the cause of which is not known nor is there any history of injury. She has complained of pain in the knee for the past year. The pain is worse on motion. One week ago she began to walk lamely. There is no loss of flesh. Swelling of the left hip was noticed first last Saturday. The patient was referred to the House of the Good Samaritan, by Dr. Legg.

X-ray examination shows considerable thickening of the cortex of the left femur with marked irregularity and roughening of the periosteum and evident encroachment on the soft parts. Sarcoma (Fig. 34, Case 20).

February 25, 1915. Note: The patient died at the House of the Good Samaritan after operation for sarcoma of the femur.

CASE 21. Tuberculosis. R. S., age 2 4/12 years, admitted to Children's Hospital, January 20, 1919. The family history is negative. The patient had bronchitis at 7 months, chicken pox at 8 months, whooping cough at 9 months, German measles, at 1 year 10 months.

Present illness. One morning in April, 1918, the patient refused to use the limbs. Shortly afterward he began to walk with a limp on the left side. He was treated for infantile paralysis. The limp has never improved. After the attack of German measles, he became weaker in the legs and again refused to walk for a few days. He resumed walking, but

Fig. 36.

Fig. 37.

Case 22.

with more of a limp. In December, 1918, a swelling appeared over the crest of the ilium, on the affected side. This increased markedly in size 6 days ago. There has never been any fever, night sweats, or loss of flesh.

Examination. Large cervical glands, Harrison's grooves, and rosary are present. Left dorso-lumbar scoliosis. There is a swelling over the crest of the left ilium. The knee-jerks are exaggerated on both sides. There is a suggestion of ankle clonus on both sides. No Babinski.

There is a swelling on the left side just lateral to the sacro-iliac joint, which is not tender, or hot. Sense of deep fluctuation is present. The swelling appears to be separate from the crest of the ilium. There is a fluctuant mass, situated directly over the sacro-iliac joint, palpable by rectal examination.

White blood corpuscles 13,400. The urine is normal. The von Pirquet is positive. Wassermann not done. The temperature is normal. Pulse 110.

X-ray examination shows a destructive process of the left sacro-iliac joint with a thin shell of cortical bone remaining, having almost the appearance of a sequestrum (Fig. 35, Case 21).

Operation, January 23, 1919, by Dr. Lovett. An incision was made over the crest of the ilium. An ounce of pus was encountered; also necrotic bone. A piece of this bone was removed for a frozen section. Report immediately made by Dr. Wolbach that this showed tuberculosis. The wound was closed with a small drain.

February 12, 1919, discharged home to report in one month to Dr. Lovett.

Pathological report by Dr. Wolbach. The permanent slide of this case contains tuberculous granulation tissue with many small tubercles, giant cells, and extensive caseation, with all appearances indicative of active tuberculosis.

CASE 22. Osteomyelitis. E. B., age 10 years, admitted to the Children's Hospital, March 6, 1916. The family history is unimportant. The patient had measles at 2 years, whooping cough at 2½ years; no other illness.

Present illness. The child fell on the ice a couple of days before the present illness was noticed. About 9 weeks ago the child complained of pain in both knees, also pain in right hip. Three days later she remained in bed with a fever of 105°. The fever continued 4 days, when the temperature gradually came down to normal in the morning, but was higher in the evening. The child has been losing weight, and has been having night cries from the beginning of the trouble.

Examination. The patient is a poorly nourished child with enlarged cervical glands. The right lower extremity is held abducted 20 degrees, with 40 degrees external rotation, and 20 degrees of flexion. No motions allowed. There is a thickening about the hip and spasm of the hip and thigh muscles. The deep iliac glands are enlarged. There is a slight limitation of motion in the left hip.

The von Pirquet is negative in 48 hours. The urine is normal. White blood corpuscles 24,000. Polymorphonuclears 79 per cent, mononuclears 21 per cent.

X-ray examination shows marked destructive process of the neck of the femur with very little evidence of any formative change (Figs. 36 and 37, Case 22).

Operation, March 9, 1916, by Dr. Legg. An incision was made over the trochanter, and the marrow cavity opened. Gray granulations were found.

Fig. 38, Case 23.

A finger was carried down to the hip-joint. The head was found to be loose in the joint. Closure with drainage, in 45 degrees abduction.

Operation, April 15, 1916, by Dr. Thorndike. Sequestrum removed. Small amount of pus evacuated.

Operation, May 6, 1916, by Dr. Lovett. A small pus pocket found in the bone, was thoroughly cleaned out.

July 27, 1916. Small abscesses continued to appear, and were drained until present date, when patient was discharged to Wellesley.

March 9, 1917. History between this date and the last is a succession of operations for pus pockets. The wound at the hip is still discharging at this date.

Pathological report by Dr. Wolbach. There are sections of three fragments of bone from the operation of March 9. They show newly-formed granulation tissue invading puriform material and enclosing necrotic bone spicules. In a few places there is new bone formation. There is no evidence of tuberculosis, and the process is that of early repair of bone after a pyogenic infection.

CASE 23. Tuberculosis. A. B., age 21 months, admitted to the Children's Hospital, January 14, 1918. The family history is unimportant. The child was normal up to 15 months.

Present illness. The patient was perfectly well up to 2 weeks ago. At that time he refused to stand or sit up. He complained of pain with motion of the head, and has held his head thrown back. There has been a marked loss of flesh during the past 2 weeks.

Examination was negative except for the local condition. The child refuses to walk, but will stand on the left leg when supported. He holds the right knee and hip flexed with slight lumbar lordosis. On the right side of the abdomen is an elongated mass in the region of the psoas muscle. It is not fluctuant or tender. There is no swelling in Petit's triangle. There is a slightly rounded prominence over the region of the spinous process of the twelfth dorsal and first and second lumbar. There is a slight swelling to the right of and below this in the muscles. The spine is rigid with muscle spasm. There is no fluctuation or local tenderness. The right hip is held in 45 degrees permanent flexion. There is a slight exaggeration of the knee-jerks.

The von Pirquet is positive in 12 hours (human and bovine). White blood corpuscles 13,600. The urine is normal.

X-ray plates show thickening and elevation of the periosteum and increased density in the soft tissues over the thickened bone (Fig. 38, Case 23).

January 22, 1918. The patient was put in a posterior shell, and discharged to out-patient department.

April 22, 1919. Re-entry. One month ago the patient began to have pain in the left lower leg. Four days ago the mother noticed a reddened area the size of a 10-cent piece at the juncture of the upper and middle thirds, and in front of the leg. This gradually increased in size. In the middle third of the left leg is a symmetrical swelling over which the skin is red, and quite warm. In the center of this there is an area of fluctuation.

Operation, May 14, 1919, by Dr. Lovett and Dr. Wolbach. An incision over the left tibia discloses a superficial abscess cavity, containing one ounce of fluid pus. Granulations and pieces of fascia were taken by Dr. Wolbach. Periosteum was thickened, but bone was of normal appearance. The wound was closed without drainage.

June 19, 1919. The patient was discharged to Wellesley. The leg wound healed, and the patient wears a plaster jacket.

Pathological report. There are two slides: one of fascia with miliary tubercles, much lymphoid and plasma-cell infiltration and little caseation, and one of tuberculous granulation tissue with much caseation and many small tubercles, with giant cells. The whole is indicative of active tuberculosis.

CASE 24. Tuberculosis. R. K., age 2 3/12 years, admitted to the Children's Hospital, March 10, 1919. The family and past history is negative.

Present illness. At 11 months of age it was noticed that the right hand was becoming thicker in the anteroposterior plane. There was no pain associated with this and no disability, no loss of weight. There was slow progress for 16 months, at which time it was noted the right leg was also becoming thicker. The child walked without complaint.

Examination. The child is normal except for local condition. There is swelling on the back of the hand over the third metacarpal; no redness, local heat, or tenderness. The swelling is quite marked over the right tibia, no redness, local heat or tenderness.

The urine is negative; the von Pirquet positive; the Wassermann negative. White blood corpuscles 19,000. Temperature 100° to 101°. Pulse 100 to 110.

X-ray examination shows: (1) a destructive process in the center of the shaft of the right tibia, with considerable thickening of the cortex and a marked new formation of periosteal bone; (2) a destructive process just below middle of shaft of the right radius with periosteal reaction of quite

marked degree; (3) destructive process of the whole third metacarpal bone of the right hand (Figs. 39, 40, 41, and 42, Case 24).

Operation, March 25, by Dr. Sever. No pus was found under the periosteum of the tibia. Pus was found in the medullary cavity. No organism was seen by microscope.

April 11. Dr. Wolbach reported active tuberculosis of bone.

April 30. Discharged. The wound showed little tendency to heal.

Pathological report by Dr. Wolbach. The material consists of sections of three fragments of cortical bone, all showing marked resorption of bone with great enlargements of the haversian canals. The inner layer of the cortex is reduced to a coarsely trabeculated structure and there is evidence of rapid decalcification and resorption of the bone tissue. Between the trabeculæ and their remains is a loose textured vascular connective tissue in which are numerous miliary tubercles which have not progressed to caseation. The tubercles are very characteristic and consist of collections of mononuclear cells (epithelioid or endothelial) with typical giant cells. The most striking feature of the sections is the diffuse reaction with absorption of bone, apparently by a process of decalcification, as osteoclasts are rare and many of the degenerated trabeculæ of bone are surrounded by osteoclasts. Here and there new bone is being laid down, and the two processes of bone formation and resorption are curiously intermingled in what is essentially the tissue formed in the diffuse reaction to the tubercle bacillus. The connective tissue response, resulting in a diffuse granulation tissue formation with tubercles, is essentially the process seen in pyogenic infections of bone in early repair (Figs. 43 and 44, Case 24).

The interpretation of the above findings is that the process is one of considerable rapidity and rapid extension, and the effect upon the bone forming cells is essentially that seen in the early repair of pyogenic infections.

Case 25. Syphilis. J. D., age 7 8/12 years, admitted to the Children's Hospital, February 26, 1915. The father had neisserian infection and the mother had acne 10 years before marriage. A maternal aunt had keratitis when a child. There have been no stillbirths or miscarriages in the family. The patient is a normal child. He had measles at 2, at 3 months had eruption of sores about mouth, the scars of which can now be seen, at 4 years had keratitis, treated at the Eye and Ear Infirmary, 3 weeks ago had tonsillitis with swollen glands of the neck. Ever since birth the child had enuresis.

Present illness. For five years there has been bowing of the left shin bone. This was first noticed by the mother, when the leg was swollen, tender, and sore. The pain and tenderness were worse at night. There were no night cries or night sweats. During the past 2 years the swelling has become worse, but the pain has decreased. He has been

Fig. 45. Case 25.

treated by "blood medicine" for the past 3 years. He has always been pale and anæmic looking. The swelling has never broken down nor discharged pus.

Examination. The patient is poorly nourished and developed, has general glandular enlargement, scars at corners of the mouth. The teeth are notched. The liver is palpable about an inch below the right costal region; there is a separation of the recti. The patient stands with a decided list to the right showing a slight right dorsal scoliosis. The patient walks with a fair amount of right-sided limping, but no functional disability. There is a limitation of external rotation of the right hip to 30°. On the right thigh there is a general outward and forward prominence of the femur, especially in its lower three-fifths, with considerable thickening of the shaft. The left thigh is similar to the right though the deformity is not so marked. The left leg shows a marked overgrowth of the tibia in thickness, forming a prominent general forward bowing, especially in its lower two-thirds, and a considerable overgrowth in length. The fibula also shows overgrowth. There is a general roughness over the crest of the tibia. The reflexes are exaggerated on the right. There is a positive Oppenheim on the left.

March 1. Dr. Derby saw patient for eye condition. He reports a fine scar on the left cornea, and the remains of an old choroid retinitis. The whole condition is most suggestive of old syphilitic keratitis.

Fig. 46, Case 26.

March 2. Dr. Post saw the patient and considers the upper central incisors "near Hutchinsonian." The scars about the lips are unusually well marked.

March 7, 1915. The patient was discharged home to take medicine.

X-ray examination shows: (1) marked thickening of the cortex and periosteum of the lower half of the left tibia (Fig. 45, Case 25).

Diagnosis: syphilis.

CASE 26. Tuberculosis. I. M., age 10 years, admitted to the Children's Hospital, December 30, 1918. The father died of tuberculosis. The past history is negative.

Present illness. One year ago a girl stepped on her left foot and she went to the Massachusetts General Hospital. The foot was put in the cast and kept in it 4 months.

Examination. There was glandular enlargement in the posterior triangles of the neck. The child was otherwise normal, except for the local condition. There was fusiform swelling over the dorsum and inner aspect of the left foot particularly. There was no redness or discoloration. Two small scars were seen on the inner aspect of this mass, apparently healed sinuses. There was tenderness over the swelling, and limitation of ankle-joint by about 10 degrees in dorsi and plantar flexion.

The temperature shows a nightly rise from 99 to 100°. Pulse averages around 94. The von Pirquet is definitely positive in 24 hours, the Wassermann negative. White blood corpuscles 12,400. The urine is normal. X-ray examination shows fracture of the base of the first metatarsal and absorption of lime salts (Fig. 46, Case 26).

Operation, January 13, 1919, by Dr. Lovett. An incision was made over the first metatarsal joint. The tissue was cheesy and yellowish looking. Dr. Wolbach took his own specimen. A report came back in 10 minutes of positive tuberculosis. The wound was closed without drainage.

January 23, 1919. The wound healed by first intention. The patient was discharged in a bivalved cast to Wellesley.

Pathological report by Dr. Wolbach. The sections include bone, articular cartilage and ligament, all showing tuberculosis. The bone is largely replaced dense tuberculous granulation tissue in which are many tubercles surrounded by fibrous tissue zones. The tubercles are occasionally caseous. The process is that of slowly-progressing tuberculosis with much fibroblastic reaction. No new bone formation can be seen in the material at hand. There is no acute reaction.

DISCUSSION

The diagnosis of infectious lesions of the bones would be simple if each infectious agent always produced the same reaction. The pyogenic bacteria alone may be counted upon to conform to type; at first destruction of tissue followed by repair, which in the case of bone means necrosis with more or less local disappearance of lime salts followed by new bone formation from adjacent healthy bone structures. It must be remembered in the reaction of bone to injury that new formation of tissue is always followed by ossification and therefore that granulation tissue from bone or periosteum becomes bone tissue.

The above simple sequence in the pyogenic infections accounts for the definite criteria applicable in osteomyelitis. It is conceivable that a rapid healing of a small abscess in bone might result in very little granulation tissue production from adjacent tissue with very little production of new bone, and this seems to have been the result in Case 4.

Syphilis affects bone in two ways, both effects of the proliferative reaction of the casual agent, and results either in the destruction of bone, or the new formation of bone. Both effects may occur in the same case. Destruction of bone follows the formation of local, rapidly-formed gummatous lesions, sometimes of endosteal and periosteal origin, sometimes perivascular and extending into bone. On the other hand, the degree of reaction to the spirochæta may be slight and result only in proliferation of cells of the

periosteum and endosteum, the newly-formed tissue developing osteoblasts and eventually new deposits of bone is the result. In one case, therefore, there is choking of normal bone by the gummatous process with its necrosis; in the other case there is merely stimulation of bone-forming tissue.

Tuberculosis presents more possibilities. In soft tissues it is known that the tubercle bacillus can duplicate the reaction of almost any type of pathogenic bacterium. Thus the various types of exudative response to injury may be the result of the tubercle bacillus alone; exudates essentially fibrinous or essentially puriform in character are frequently found upon serous membranes—meninges, peritoneum, pleura, and pericardium. In bone we usually think of tuberculosis as a proliferative process resulting in the new formation of tissue with consequent obstruction of the bone, and this is the commonest type of tuberculous bone lesion which gives rise to the formation of bone cavities without a peripheral reaction or condensation of bone.

In tuberculosis of bone, as in soft tissues, there may occur: (1) exudate, fibrinous or puriform, (2) discrete proliferative lesions, the tubercle which may progress slowly or rapidly with much or little caseation, and (3) a diffuse proliferative reaction, following the exudative—essentially tuberculous granulation tissue, with much or little caseation. In the third instance, in the granulation tissue, there may be new bone formation just as in the repair of pyogenic processes, at a time when destruction or resorption of bone is going on. In Case 24 is an excellent example of this double process, "destructive" and "formative," due solely to the tubercle bacillus. The X-ray plates not only resembled those of a pyogenic infection but the appearances of the bone at operation were equally confusing to the pathologist, whose diagnosis based upon the gross was early osteomyelitis.

It is of interest to note that the effect of the tubercle bacillus in this case upon the cortical bone was not unlike that of the more toxic staphylococcus in that necrosis of bone trabeculæ occurred with decalcification remote from actual tubercles. That this process may, in rare instances, result in sequestrum formation is shown in Case 17.

The punched-out lesions of the bone in Cases 14 and 15 represent a rapid discrete extension of the proliferative reaction followed by extensive caseation.

The important lesson from the pathological study of this series of cases is the reminder that tuberculosis in bone may simulate any other infectious process in location and character of the lesion. Diagnosis from X-ray studies alone is therefore occasionally impossible and recourse must be had to other clinical evidence, and when possible to pathological examination.

URETERO-URETERAL ANASTOMOSIS[1]

By REUBEN PETERSON, M.D., F.A.C.S., Ann Arbor, Michigan

ANASTOMOSIS of the resected or incised ends of the ureter may be classed as an uncommon operation. Only rarely does the surgeon remove portions of the ureter deliberately. If this be done for malignant disease, anastomosis of the ureter with the bladder is usually chosen as a less hazardous procedure than uniting the cut ends of the ureter. Only rarely is the ureter severed accidentally by the skilled surgeon. When the accident occurs in unskilled hands, more often than not it goes undiscovered and death is ascribed to shock or peritonitis.

Since the operation of uretero-ureteral anastomosis is rare, it becomes the duty of the surgeon to record each case in detail, especially the end-results, so that doubtful points about the operation may be eventually cleared up. The task of the reporter, however, has been made more difficult by improvements in the methods of direct examination of the genito-urinary tract made during the past 20 years. A patient with an anastomosed ureter cannot be pronounced cured, so far as the operation is concerned, until bladder, ureter, and the corresponding kidney have been explored, functional tests performed, and ocular demonstrations of the condition of the urinary tract made by the X-ray. Without such work the cured patient may in reality be one with an atrophic or hydronephrotic kidney where the repaired ureter leads to the bladder but does not functionate, the patient being "perfectly well" because the other kidney and ureter are doing double work very satisfactorily.

Fig. 1. Roentgenogram of right ureter and pelvis of kidney showing moderate dilatation of ureter and pelvis of kidney. No. 6 F. catheter.

Fig. 2. Right ureter 6 months after an end-in-end uretero-ureteral anastomosis. Fluid ran back from pelvis of kidney around No. 5 F. catheter, filling the bladder.

[1] Read before the Southern Surgical Association, New Orleans, December 17, 1919.

Fortunately, I am able to report the following case of uretero-ureteral anastomosis subject to the conditions set forth above.

Mrs. H., gynecological case No. 10,387, age 49, widow, was referred to the University Hospital, May 13, 1919, by L. B. Hixson, of Durand, Michigan, for malignant disease of the cervix. Although there had been a history of irregular and profuse bleeding for more than a year, examination upon entrance showed the uterus to be freely movable with no induration to be made out in the broad ligaments. Microscopical examination of a piece of the affected cervix having established the diagnosis of medullary squamous celled carcinoma, the patient was subjected to the radical abdominal operation for the removal of the cancerous uterus, May 16, 1919.

Operation. The ulcerated, cancerous cervix was thoroughly cauterized through a water-cooled speculum prior to opening the abdomen. The broad ligaments were opened in the usual manner after ligation of the round and infundibulopelvic ligaments. Unfortunately the usual technique was departed from in tying the right uterine artery after first exposing the corresponding ureter. Long familiarity with the radical operation led me to omit the passage of the forefinger along the ureter and beneath the uterine artery. Instead, a curved ligature passer was supposedly carried along the ureter and the artery ligated between two ligatures. Much to my chagrin I at once realized that the ureter had been divided; in other words, the ligature passer had gone below the ureter as well as the uterine artery.

The left uterine artery was ligated by the usual technique, and the uterus with its appendages together with a wide vaginal cuff removed.

The incised ends of the ureter were then united in the following manner:

The distal or bladder end of the cut ureter was split with scissors on its anterior surface for a distance of one-fourth inch. The mucosa at this end was trimmed off for a short distance and the lumen of the duct stretched slightly with a hæmostat. The proximal or kidney end of the ureter was then transfixed with a fine cambric needle armed with a fine linen thread. Both ends of this suture were threaded through a straight needle which was passed through the lumen of the distal end of the ureter and out of the duct one-third inch below the angle of the slit on the anterior surface of the ureter. The proximal end of the ureter was drawn one-third inch into the distal end by means of this traction suture which was steadied by an assistant but not tied. At the point of juncture of the upper with the lower portion of the ureter the walls were united by five fine silk sutures passed by a fine curved needle. These sutures included all coats of the two portions of the ureter except the mucosa. The slit portion of the distal end was then united with three fine silk sutures which also passed through all but the mucosal coat.

The traction suture was now removed and the anastomosed ureter placed as nearly as possible in its proper position. The two cut edges of the pelvic peritoneum were brought together by a running catgut suture over the ureter and a small piece of gauze drain run out through the vagina. Both ureters were left completely peritonized.

The patient naturally was somewhat shocked by the combination of a radical abdominal hysterectomy and the ureteral anastomosis and for a few days the pulse rate was somewhat elevated. There was no leakage of urine by the vagina. The usual postoperative amount of urine was secreted, and chemical and microscopical examination showed nothing abnormal. The patient voided urine shortly after the completion of the operation and catheterization was never necessary.

The patient returned to the hospital December 12, 1919, for an examination. A careful bimanual examination showed no signs of a return of the carcinoma. Through the kindness of my colleagues, Hugh Cabot and J. G. Van Zwaluwenburg, it was possible to obtain a very complete report of the condition of the right urinary tract. Their report is as follows:

"Plates were made of the kidney region in the double screen technique before and after injection of opaque fluid. Before injection the X-ray catheter was seen in place following the usual course. The kidney shadow was not remarkable. In the plate taken after the injection of the bromide, the calyces of the right kidney were seen to be much dilated. The kidney shadow did not seem to be enlarged. The ureter appeared to be dilated to some extent throughout its length but more especially from the fifth to the third lumbar vertebra (Figs. 1 and 2).

"We believe that this patient has a minor degree of dilatation of the terminal calyces, pelvis, and ureter.

"Examination of bladder shows nothing abnormal. The ureteral orifices are symmetrical. There is no evidence of inflammation. A No. 6 F. catheter passed freely to the kidney, on both sides. There is no obstruction. Normal flow of normal urine appears from both kidneys. Kidney function as tested by phthalein shows appearance time on right of five minutes, on left four minutes. Function of right kidney in ten minutes is 5 per cent, of left 10 per cent. The capacity of right renal pelvis 16 cubic centimeters. The flow from the right side was steady and suggested dilatation and paralysis. Examination in the bacteriological laboratory of 9.25 cubic centimeters of urine from the right side showed no organisms; no growth obtained. An injection of a 25 per cent solution of sodium bromide was made and a roentgenogram taken. Fifteen cubic centimeters withdrawn from the pelvis after X-ray finished.

"Examination of the plate shows a moderate degree of dilatation of the renal pelvis and flattening of the calyces. I should regard it as a first degree of hydronephrosis.

"*Opinion.* This woman has a very slight dilatation of the renal pelvis and definite diminution of renal function on the right side. There is no evidence of infection and the amount of damage to the kidney as a whole must be regarded as exceedingly slight."

Twenty-three years ago at the Nashville meeting of this society, our distinguished Fellow, Doctor Bovée, presented his classical paper on uretero-ureteral anastomosis. At this meeting of the same society, we are able to state that almost all his conclusions have been completely justified by subsequent surgical ureteral work. In order to study this work and draw certain conclusions from it, I have carefully gone over the literature of the subject and collected 72 cases of uretero-ureteral anastomosis by various methods. Other cases, in which wrong references have been given or in which insufficient data have been furnished, have been placed in another group together with their references in order to save the time and energy of some subsequent investigator.

Bovée's first conclusion that "uretero-ureteral anastomosis is a perfectly feasible procedure" is amply borne out by a study of the 72 collected cases. It is assumed that by feasible is meant not only that the two ends of a divided or resected ureter can be united without causing the death of the patient from leakage but that the patency of the tube can be accomplished by such surgical procedures. Evidently the ends of almost any severed ureter can be sutured together, but if stenosis follows it may amount to the same thing as tying off the ureter.

Again the cases must be scrutinized carefully to see if the deaths occurred from the ureteral operation or from the operation giving rise to the accident. Had the patient in my own case died of shock from the combined radical hysterectomy and ureteral anastomosis—the latter procedure might have contributed toward the death due to the prolongation of the entire operative procedure—such death could not be counted against the feasibility of ureteral anastomosis.

There were 4 deaths out of 72 cases directly attributable to the ureteral anastomosis or a primary mortality of 5.5 per cent. Certainly this is not a prohibitory mortality, especially since all of them occurred in the early days of ureteral surgery.

It is even questionable if Morris' case should be included among deaths attributable to the operation since in all probability the large uterine myoma for which the primary operation was performed had produced double hydronephrosis by pressure. At autopsy, both kidneys were excessively hydronephrotic the right more than the left, although the latter had been cut and anastomosed. The left ureter was found to be watertight. Still, since hydronephrosis was found so soon after the operation the case was included among deaths attributable to the anastomosis.

In Blau's two cases, death resulted from defective suturing and retroperitoneal abscess in the posterior wall just back of the sutured ureter.

Although cardiac insufficiency is given as the cause of death in Sadowski's case, the autopsy showed dilatation of the ureter above the suture with an œdematous hydronephrotic kidney.

In the other cases where death followed one or the other methods of ureteral anastomosis (Schopf, Hochenegg, Pawlik, McMonagle, Gubareff, Cobb) the deaths were unquestionably due to other causes than the results of the ureteral anastomosis.

Bovée's second, fifth, and sixth conclusions that ureteral anastomosis is preferable to nephrectomy and ligation of the ureter in the light of the results from more than 60 cases of ureteral anastomosis recorded since the publication of his paper, have been shown to be perfectly sound.

As regards the third conclusion that the preferable method is the lateral implantation or oblique end-to-end anastomosis, subsequent operations have shown the primary results of all methods to be fairly good with the advantage somewhat in favor of the end-in-end or end-in-side methods. There were 29 cases of end-to-end anastomosis with 6 deaths, 4 of which were due to the operation (Group 1), while in 25 transverse end-in-end and 15 end-in-side, 40 cases in all, there were no deaths which could be attributable to the operation (Groups 2 and 3).

Looking at the question in another light it is perfectly possible that a certain operative technique will be without mortality yet be a failure so far as functional results are concerned. Leakage after the anastomosis is a sign of faulty technique, since such leakage can only cease by the formation of granulation or scar tissue and the increasing risk of stricture which may or may not lead to hydro-ureter and hydronephrosis. In 29 cases of end-to-end anastomosis, leakage was recorded in 9 cases, while in 25 of the transverse end-in-end anastomosis, there were only 5 cases of leakage and in 15 cases of end-in-side only 2 cases of leakage. In other words, the leakage after anastomosis in 40 operations with the last two methods was 2 less than recorded in 29 cases by the transverse end-to-end method.

Personally, I do not see that one is called upon to choose the end-in-side method in preference to the end-in-end method with a view of thereby avoiding a stricture at the point of anastomosis. I believe the case reported above demonstrates beyond dispute that where the anastomosis is followed by primary union, the end-in-end method need not and probably rarely produces a permanent stricture. It is the simplest of all the methods and sacrifices but a small portion of the ureter, since it is necessary to invaginate only one-quarter or one-third inch of the proximal portion of the ureter. When considerable portions of the duct have been accidentally or deliberately resected and the tension is rendered too great by invagination of even a small part of the ureter, it is possible that transverse end-to-end anastomosis may be the preferable operation. Even here I would prefer approximation of the severed ends after loosening the bladder or kidney and the completion of the operation by the invagination method.

I am unable to see the advantage of the non-removal of the traction sutures; certainly not if the suturing about the joint made by the insertion of one end of the severed ureter with the other can be made accurate and firm enough to prevent the slipping out of the proximal end. Removal of the traction suture does away with any chance of leakage through the suture tract, while the avoidance of the mucosal coat in the suturing about the joint also serves to prevent any leakage from a similar cause at this point. Finally, I believe that when the mucosa is removed for a short distance within the distal end of the tube, firm union takes place rather rapidly and that this is an important part of the technique so far as the prevention of leakage is concerned.

Retroperitoneal drainage should undoubtedly be employed, care taken being that the drain does not come in contact with the anastomosis. Since the large majority of the anastomoses will be in women, it is comparatively easy to drain retroperitoneally through the vagina. The ureteral anastomosis should always be carefully peritonized and as the duct is shut away from the general abdominal cavity in a comparatively few hours, subsequent escape of urine from an imperfect anastomosis would be harmless, so far as mortality is concerned.

It would seem as if the complicated methods of Monari and Soresi (Group 6) for uniting the severed ends of the ureter were too complicated and unnecessary. Each method was devised to prevent ureteral stricture, which experience has shown does not follow more simple anastomotic methods. Monari's method employed by Fournier in one case (Group 5) is a side-to-side, lateral anastomotic method, while Soresi's method is a combination of the transverse, end-to-end and side-to-side methods.

It must ever be borne in mind that from the nature of things, ureteral anastomosis will always be a rather rare operation, hence a simple, safe method must be adopted and its principles grasped, so that when called upon to unite the severed ends of a ureter, the surgeon will not be obliged to employ a complicated technique with which he has not had an opportunity of becoming familiar. Lateral anastomosis of the intestinal tract is a perfectly satisfactory operation, because the surgeon has frequent opportunities to become familiar with the technique, while such a procedure as applied to the ureter would be bound to fail in a certain proportion of cases because of the lack of familiarity.

It follows from what has been previously stated that Bovée's oblique end-to-end anastomosis employed successfully by him in one case (Group 4) is an unnecessary refinement of technique, since successful anastomosis of the ureter without stricture can be made by the simpler end-in-end invagination method. Possibly Bovée had arrived at the same conclusion when he employed this latter method in a second case of ureteral anastomosis.

The necessity of careful examination of the urinary tract which has been subjected to uretero-ureteral anastomosis, has already been referred to. Without such an examination the reporter is simply guessing, for it is a well-known fact that a patient may apparently be in perfectly good health and still have atrophic or hydronephrotic, functionless kidney. Very few operators have recorded such postoperative urinary tract examinations.

McMonagle, as early as 1895, made a cystoscopic examination of the bladder of a patient whose left ureter had been successfully anastomosed by the transverse end-in-end method one year previously. He satisfied himself that the ureter was permeable, since he saw urine coming from the ureteral orifice. Three years later the woman was in good health. This is an exceedingly valuable observation and one far in advance of his time but we are still left in doubt as to what happened to the left ureter and kidney between the date of this examination and the last report, 3 years later. The patient may have been well with a functionless kidney and ureter.

In a patient upon whom an oblique end-to-end anastomosis had been done, Bovée found upon passage of an ureteral catheter 6 months later that the ureter was without stricture. Forssell makes the same observation about his case of end-in-end anastomosis, the ureteral sound revealing no stricture 2 years after the operation. Pozzi and Kayser passed ureteral catheters after end-in-end anastomoses and found both absence of stricture and normal kidney function, although Pozzi thought there was a difference in the flow of urine from the side operated upon, and explained the continuous flow of urine from this side as due to a lack of contractility (peristalsis) from that side. Lavisé reports the ureteral orifice and bladder normal 3 weeks after end-to-end anastomosis. Davis collected the urine from both sides of the bladder by the Harris' segregator one month after an end-in-end uretero-ureteral anastomosis and demonstrated the ureter operated upon to be patent and the urine normal. Perlis by cystoscopic examination after an end-to-end anastomosis was able to report that clear urine came from both ureteral orifices. Fournier, 2 months after an ureteral anastomosis by the Monari method, found urine from both ureters normal. Reed 4 weeks and 6 months after an end-in-side anastomosis satisfied himself by the use of the Harris segregator that normal urine came from both ureteral orifices.

These are the only observations I have been able to find in connection with the 72 collected cases of ureteral anastomosis, and it will be noted that in no case is any information furnished beyond the permeability of the sutured ureter and the condition of the urine coming from that side. We are left absolutely in doubt as to the size and condition of the pelvis of the kidney and ureter on the side operated upon—points to be settled if we are to be in possession of all facts as to what happens after the ureter is cut and united.

It has been impossible to draw any definite conclusions regarding the functional results of ureteral anastomosis in the 72 cases. As has been before pointed out, the fact that a patient is in good health and suffers from no pain so many months or years after the anastomosis, means very little so far as proving that the ureter operated upon and corresponding kidney are functionating.

A good example is Frederick's case, reported in 1901. About 1895 he did an end-in-end uretero-ureteral anastomosis of the right ureter, an inch of which had been removed during a hysterectomy for a uterine fibroid. Then followed vaginal leakage for about 8 months, when the patient developed symptoms of acute hydronephrosis accompanied by cessation of the leakage. Frederick reported the patient as perfectly well 5 years

subsequent to these symptoms. Fortunately some 10 years later he was able to secure an autopsy on this patient. The autopsy showed stenosis at the point of the anastomosis, dilatation of the ureter above the anastomotic point to the size of the thumb, and a hydronephrotic kidney the size of a child's head.

Had it not been for Frederick's scientific interest in this case leading him to follow it up for a good many years it would have been called a cure when in reality it was a functional failure. Although the patient survived the anastomosis, the resulting condition was such as to be followed by ureteral leakage, hydro-ureter and hydronephrosis, chronic in form and giving rise to few symptoms, but enough to cause death 15 years later. Nephrectomy would have been the preferable operation here, could the subsequent history of the patient have been foretold.

When uretero-ureteral anastomosis is not followed by leakage there is an excellent chance of good surgical and functional results. When the anastomosis is followed by leakage, success surgically and functionally must be, from the nature of the case, rare. Each such case should be carefully watched with a view of subsequent surgical interference. In case the leakage be permanent, nephrectomy may be indicated in preference to a second attempt at uretero-ureteral anastomosis, when the ureter and kidney have been greatly changed by adhesions and resulting compression at the site of the anastomosis.

There will be very little argument regarding the possibility that hydro-ureter and hydronephrosis with or without accompanying infection may follow defective ureteral anastomotic suturing. Yet the statement that every repair of a sectioned ureter will be followed by distinct pathological changes in the ureter and kidney may not be so readily accepted. Yet there is a certain amount of evidence to support the truth of such a statement.

Alksne, of the Federoff Surgical Clinic in St. Petersburg, in 1908, published an exhaustive experimental study of the different methods of uretero-ureteral anastomosis. Many of his dogs subjected to the anastomosis died so that one is forced to question the excellence of his operative technique. Still not a few of the animals lived and showed good surgical successes so far as the anastomoses were concerned. The interesting part of the research to me is the author's conclusions which in part may be stated as follows:

"Experiments show that all ureteral sutures are followed by a certain stenosis of the duct from traumatic œdema. The suture of the ureter may be perfect, yet the functional result may be poor. All sutured ureters show a characteristic type of excretion of the urine. Atony of the sutured part causes cessation of the peristaltic waves of the ureter giving rise to ureteral pocket formations. The urine accumulates in these pockets above the point of suture until enough has accumulated to force it below the anastomotic point. This will lead in all cases to hydro-ureter and in most cases to hydronephrosis."

How else can the findings in the case just reported be explained? Clinically the result of the uretero-ureteral anastomosis was perfect so far as could be judged. There was no leakage and nothing in the urine to show that there was infection of the urinary tract. Six months after the anastomosis, during which time there were no symptoms referable to the urinary tract, examination shows absolutely no signs of stricture but a moderate degree of dilatation of the ureter and kidney and definite diminution of the renal function on the side operated upon.

This looks like a confirmation of Alksne's contention that changes in the ureter and kidney follow every case of anastomosis. Mechanically and surgically the result in the reported case was excellent. There was absolutely no evidence of a stricture at any point of the duct. Yet the ureter and pelvis of the kidney were dilated.

The explanation of what causes the "atony" of the sectioned ureter referred to by Alksne has not been worked out. He ascribes it to cutting through of the muscles of the ureter and scar formation. It is possible that section of the ureter interferes with its nerve supply so that atony results. It is idle to speculate as to the causes of the condition until existence of the latter has been established beyond

question by the findings of more than one case. Hence the importance that each case of ureteral anastomosis be worked out carefully as regards the condition of the ureter and kidney.

Pozzi's and the present case also show evidence of hydro-ureter following the passage of the ureteral catheters. It will be recalled that Pozzi noticed a continuous flow of urine from the ureter operated upon and correctly ascribed it as due to a lack or diminution of the normal ureteral peristalsis. The same phenomenon was present in my own case. This continuous flow of urine from the ureteral catheter is characteristic of hydro-ureter and is a finding which is even used by urologists as a diagnostic measure in determining the exact portion of the duct which is dilated.

Granted the correctness of the conclusion that every sectioned ureter, no matter how successfully repaired, will be followed by a slight degree of hydro-ureter and hydronephrosis, such resulting condition may not be at all a menace to life or health, provided infection does not occur or if the operation has not been performed upon ureters and kidneys already diseased. Evidently the danger of excessive hydro-ureter and hydronephrosis will be greatly enhanced when the anastomosis is made in a ureter already dilated. Even here, provided primary union takes place, a fairly serviceable ureter and kidney may be found after the anastomosis. Each case must be judged by itself always bearing in mind that the functional result must inevitably be worse when the operation is performed on abnormal ureters.

The pathological changes will always be greater and the functional results worse when the surgical results are poor. Stenosis at the anastomotic point from faulty technique causing stricture and stenosis or imperfect suturing giving rise to leakage, must almost invariably lead to marked degrees of hydro-ureter and hydronephrosis. Such conditions may cure themselves through atrophy of the kidney or, if infection supervenes, may seriously menace the life of the patient if nephrectomy be not resorted to (Cobb, Morris).

Even if further observations prove that repair of the sectioned ureter will be followed by slight dilatations of the ureter and kidney and a diminution in the function of the latter, it will not mean that the operation of uretero-ureteral anastomosis must be discarded. Even diminished function is better than the complete loss which follows nephrectomy or ligation of the ureter.

CONCLUSIONS

1. No case of uretero-ureteral anastomosis can be classed as cured or successful until so proved by the most modern exploration of the repaired duct and the corresponding kidney.

2. A study of the literature of ureteral anastomosis by various methods shows that anastomosis by the end-to-end, end-in-end, and end-in-side methods is a perfectly feasible procedure.

3. Not only can the duct be made patent with little or no stricture, but a functionating kidney and ureter can result.

4. In skilled hands the primary mortality due to any one of the three methods should be very small.

5. Leakage after uretero-ureteral anastomosis probably in the large majority of cases means failure since it leads usually to stricture, hydro-ureter, and hydronephrosis.

6. Judged from this standpoint the invagination methods are preferable to the transverse end-to-end method since they are followed by fewer cases of leakage.

7. The end-in-end method of anastomosis is the operation of choice, since it is extremely simple and sacrifices the minimum amount of the ureter.

8. As claimed by Alksne from an experimental study of the different methods of uretero-ureteral anastomosis there is evidence to show that every uretero-ureteral anastomosis, no matter how perfect may be the surgical result, will be followed by a slight degree at least of hydro-ureter and hydronephrosis.

9. Although such a claim is borne out by the findings in the case reported, it needs to be confirmed by careful examination of other cases operated upon.

GROUP I.—TRANSVERSE END-TO-END ANASTOMOSIS

CASE 1. Operated upon by Schopf (53), June 2, 1886. There was no leakage. The patient died 7 weeks after operation from tuberculosis. At autopsy the right kidney was found to be the size of a hen's egg, the parenchyma contracted, the kidney pelvis distended. There was amyloid degeneration of the left kidney. The right ureter was imbedded in connective tissue and resembled a linear cicatrix. There were phosphatic concretions on the bladder wall.

CASE 2. Operated upon by Hochenegg (27), February 9, 1890. The patient died on the twentieth day, from hæmorrhage. At autopsy the bladder and ureter sutures were found intact. The source of the hæmorrhage was not found.

CASE 3. Operated upon by Fritsch (21), in 1891 or 1892. The patient recovered but the end-result is not given.

CASE 4. Operated upon but Tauffer (56). Both vaginal and abdominal drainage was used. The patient recovered and was reported "cured."

CASE 5. Operated upon by Tauffer (56). Both vaginal and abdominal drainage was used. The patient recovered and was pronounced "cured."

CASE 6. Operated upon by Cushing (14). Abdominal drainage was used. Leakage persisted for about 2 weeks. The patient recovered. "Perfect result" two years after operation; "good result" 2 years later.

CASE 7. Operated upon by Blau (5), in 1894. Vaginal drainage was used. There was some leakage. The patient recovered, but the result is not stated.

CASE 8. Operated upon by Busachi (6). There was leakage for a few months. The patient recovered and remained in "good health" for one year after operation.

CASE 9. Operated upon by von Eiselsberg (40), in 1896. There was leakage for 20 days. The patient recovered, but the result is not stated.

CASE 10. Operated upon by Blau (4), March 4, 1896. The patient died on the third day, from peritonitis. Autopsy revealed a defective suture and purulent peritonitis.

CASE 11. Operated upon by Poroschin (46). The patient recovered, and five weeks after operation the recovery was still reported "good."

CASE 12. Operated upon by Morris (41), July 21, 1897. The patient died 51 hours after operation. Autopsy revealed both kidneys hydronephrotic, the right more than the left; its parenchyma much atrophied. The calyces of the left kidney were greatly dilated; the cortical substance was very thin. Both ureters and renal infundibula were considerably dilated. The left ureter was quite watertight.

CASE 13. Operated upon by Gallet (22). The patient recovered but the result is not stated.

CASE 14. Operated upon by Lavisé (32), October 21, 1898. Vaginal drainage was used. Although there was some temporary leakage, the patient recovered. Cystoscopic examination of the urinary tract, November 13, 1898, failed to show the right ureteral orifice, but showed mucous membrane rich in blood vessels and the bladder normal. The patient was examined later and was found to be in perfect health, with normal kidneys, not enlarged, and urine and micturition normal.

CASE 15. Operated upon by Depage (16). There was no leakage, and the patient made a complete recovery.

CASE 16. Operated upon by Allen and Briggs (2), March 6, 1899. Vaginal drainage was used. There was leakage for about 2 months. The patient recovered; the operation was probably successful.

CASE 17. Operated upon by Blau (5), in 1899. The patient died on the second day. Autopsy showed a retroperitoneal abscess on the posterior wall just back of the sutured ureter.

CASE 18. Operated upon by Kelly (30). Abdominal drainage was used. There was permanent leakage. The patient recovered but the result is not stated.

CASE 19. Operated upon by Perlis (45). Abdominal drainage was used. The patient recovered. Six months after operation, cystoscopic examination showed function of ureter to be normal.

CASE 20. Operated upon by Perlis (45). The patient recovered but the result is not given.

CASE 21. Operated upon by Sawinow (51). The patient recovered; result not given.

CASE 22. Operated upon by Sadowski (50). The patient recovered; result not given.

CASE 23. Operated upon by Sadowski (50). The patient died on the fifth day from cardiac insufficiency. At autopsy a narrowing was found at the site of the suture. The ureter was dilated above the latter and was permeable. The kidney was œdematous; hydronephrosis.

CASE 24. Operated upon by Hein (26). The patient recovered; result not given.

CASE 25. Operated upon by Hein (26). The patient recovered; result not given.

CASE 26. Operated upon by Williams (60), in September, 1909. The patient was cured and reports no trouble referable to the pelvic or renal regions one year later.

CASE 27. Operated upon by Broun (10). Vaginal drainage was used. There was some leakage although the patient recovered from operation. The result was failure, however, and the patient was operated upon again.

CASE 28. Operated upon by Gouverneur (33). There was some leakage but the patient recovered. The end-result was successful.

CASE 29. Operated upon by Gouverneur (33). The patient recovered; end-result successful.

GROUP II.—TRANSVERSE END-IN-END ANASTOMOSIS

CASE 1. Operated upon by Pawlik (44), March 28, 1889. The patient died from shock 14 hours after operation. Autopsy revealed bloody fluid in the abdomen, chronic peritonitis, perihepatitis, perisplenitis, fibrinous inflammation of the intestinal serous membrane. The sutured ureter was patulous; no leakage.

CASE 2. Operated upon by McMonagle (37), September 24, 1894. Vaginal drainage was used. There was no leakage. The patient recovered and was reported living and well five years after operation.

Case 3. Operated upon by McMonagle (37), December 2, 1894. Vaginal drainage was used. The patient died from shock about 10 hours after operation. The end-result is not stated.

CASE 4. Operated upon by Mayo-Robson (35). The patient recovered and is reported well 6 months after operation.

CASE 5. Operated upon by d'Antona (3), in 1895. The patient recovered but the end-result is not given.

CASE 6. Operated upon by McMonagle (37), March 10, 1895. Vaginal drainage was used. The patient recovered. One year later, cystoscopic examination shows the urine coming from the repaired ureter. Three years after operation the patient is reported in good health.

CASE 7. Operated upon by Frederick (20) in 1895 or 1896. Vaginal drainage was used. There was leakage for about 8 months. The patient recovered. Several years later the patient died and examination at autopsy showed stenosis

at the anastomotic point; the ureter dilated above suture to the size of the thumb, was sacculated all the way up; hydronephrosis, with the kidney as large as an infant's head, thinned out and degenerated.

CASE 8. Operated upon by Winslow (61), June 16, 1897. The patient recovered; end-result not given.

CASE 9. Operated upon by Markoe and Wood (39), November 24, 1897. Both vaginal and abdominal drainage was used. There was some leakage for several days. The patient recovered, but the end-result is not stated.

CASE 10. Operated upon by Noble (43), July 2, 1898. The patient recovered; the end-result is reported as successful.

CASE 11. Operated upon by Noble (43), in October, 1898. Both vaginal and abdominal drainage was used. There was no leakage. The patient recovered and the end-result is reported as successful.

CASE 12. Operated upon Mackenrodt (34) in 1899. The patient recovered but died 2 years later from pneumonia. Autopsy showed a narrowing of the lumen in the repaired ureter; the left kidney smaller than the right and atrophic; hydronephrosis.

CASE 13. Operated upon by Davis (13), February 26, 1900. Abdominal drainage was used. There was no leakage. The patient recovered. One month after operation a Harris segregator was passed. The ureter was patent and urine came from both sides.

CASE 14. Operated upon by Bovée (8), June 11, 1900. There was no leakage. The patient recovered; result not stated.

CASE 15. Operated upon by Coe (13), June 17, 1900. Vaginal drainage was used. The patient recovered and has remained well.

CASE 16. Operated upon by Turner (57), June 26, 1900. Vaginal drainage was used. The patient recovered and was "quite well" one year later.

CASE 17. Operated upon by v. Gubareff (25), in 1901. The patient died from amyloid degeneration of the abdominal organs. Autopsy 31 days after operation showed the ureter completely restored.

CASE 18. Operated upon by Cabot (11), May 3, 1901. Both vaginal and abdominal drainage was used. There was no leakage, the patient recovered. One year and 4 months after operation the abdomen was opened. The ureter at site of suture felt normal and there was complete restoration of function.

CASE 19. Operated upon by Wertheim (59), December, 1901. The patient recovered; function was restored.

CASE 20. Operated upon by Pozzi (47), May 29, 1906. Both vaginal and abdominal drainage was used. There was leakage for about 1 month. The patient recovered. Clear urine was obtained by catheter 3 months after operation.

CASE 21. Operated upon by Forssell (21), June 13, 1907. Drainage was used. The patient recovered. Two years after operation a sound was passed. The urine flowed from the repaired ureter; no obstruction.

CASE 22. Operated upon by McMurtry (38) in 1910. Drainage was used. There was leakage for 3 days. The patient recovered. The result is not stated.

CASE 23. Operated upon by Schou (54). The patient recovered; favorable result.

CASE 24. Operated upon by Proust and Buquet (48), March 23, 1912. Both vaginal and abdominal drainage was used. There was leakage for about 18 days. The patient recovered. The result is not stated.

CASE 25. Operated upon by Kayser (29), May, 1914. The patient recovered. Four weeks after operation, a sound was passed. The repaired ureter was permeable, the kidney function normal.

GROUP III.—END-IN-SIDE ANASTOMOSIS

CASE 1. Operated upon by Kelly (31), May 1, 1892. Abdominal drainage was used. There was no leakage. The patient recovered; result not stated.

CASE 2. Operated upon by Emmet (17), November 22, 1894. Abdominal drainage was used. The patient recovered; result not stated.

CASE 3. Operated upon by Schauta (52), November, 1898. Drainage was used. There was leakage, but the patient recovered from operation. The result is not stated.

CASE 4. Operated upon by Morris (41), February 20, 1899. Drainage was used. There was some leakage. The patient recovered but the operation was unsuccessful. Healing was defective and a nephrectomy was done 3 months later.

CASE 5. Operated upon by Coe (13), June 3, 1899. Vaginal drainage was used. Leakage was present 1 year later. The patient recovered; result not stated.

CASE 6. Operated upon by Goodhue (23). The patient recovered; result successful.

CASE 7. Operated upon by Finney (6). The patient recovered; result not stated.

CASE 8. Operated upon by Reed (49), in December, 1901. The patient recovered. Four weeks after operation a Harris segregator was passed and urine came from both sides. This was repeated 6 months later with same result.

CASE 9. Operated upon by Johnston (28), October 1, 1902. Vaginal drainage was used. The patient recovered, and function was found to be perfect 29 days after operation.

CASE 10. Operated upon by Graves (24), October 31, 1907. The patient recovered and has remained in excellent health for a number of years.

CASE 11. Operated upon by Doherty (58). The patient recovered; result not stated.

CASE 12. Operated upon by Cobb (12). The patient died from shock.

CASE 13. Operated upon by Cobb (12). The patient recovered; result not stated.

CASE 14. Operated upon by Cobb (12). The patient recovered; result not stated.

CASE 15. Operated upon by Cobb (12). The patient recovered; result not stated.

GROUP IV.—OBLIQUE END-TO-END ANASTOMOSIS

CASE 1. Operated upon by Bovée (9), April 30, 1896. No drainage was used. The patient recovered. Six months after operation a sound was passed; no constriction was found.

GROUP V.—SIDE-TO-SIDE ANASTOMOSIS (MONARI'S METHOD)

CASE 1. Operated upon by Fournier (19), September 15, 1905. Abdominal drainage was used. The patient recovered. Two months after operation cystoscopic examination showed excretion of urine from repaired ureter the same as from the other ureter.

GROUP VI.—COMBINATION TRANSVERSE END-TO-END AND SIDE-TO-SIDE ANASTOMOSIS

CASE 1. Operated upon by Soresi (55). The patient recovered; end-result, successful.

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CONSERVATISM IN THE TREATMENT OF SO-CALLED ESSENTIAL UTERINE HÆMORRHAGE[1]

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IN a paper published in SURGERY, GYNECOLOGY AND OBSTETRICS, in October, 1915, a class of cases was discussed in which the chief symptom was a marked menorrhagia varying from 8 to 12 days, in some instances dating back to the first menstrual period, and occasionally associated with varying periods of metrorrhagia. These cases had been labeled with varying names such as chronic metritis, fibrosis uteri, metropathia hæmorrhagica and for want of a better terminology, essential uterine hæmorrhage. The name assigned to the condition is of no great importance, the essential point being the proper grouping and recognition of these cases so as not to confuse them with uterine bleeding from such causes as tumors, inflammatory lesions or other demonstrable abnormalities. The histological study of the material removed at operation disclosed no definite etiological cause. The changes that were found in the uteri of these cases were also found in a number of normal control cases. Neither the myometrium, the fibrous tissue, the elastic tissue nor the changes in the blood vessels could be viewed as the causative agent. There was consistently found, however, one definite variation from the normal in these bleeding cases, namely a marked hypertrophy of the endometrium with cystic dilatation of many of the glands. While this was not looked upon as the etiological factor, its constant association with the bleeding was held to be of some importance. It was suggested that the agent causing the abnormal bleeding also manifested its activity by causing a mucosal hypertrophy. The picture resembled greatly an exaggeration of the normal pre-menstrual phase in the menstrual cycle. While such an analogy was striking in appearance, it was realized that no definite conclusions could be reached when based simply on histologically similar appearance. Nevertheless, in view of the established proof that a normal ovarian function controlled the menstrual cycle and thus determined the histology of the uterine mucosa, it was suggested that possibly some disturbed ovarian function caused the abnormal bleeding and the associated lesion in the mucosa of the uterus.

With this in mind we made a study of the ovaries from 18 cases. These organs varied

[1] Work done under tenure of a George Blumenthal, Jr., Fellowship.

considerably in size, but the one important finding was the presence of numerous cystic follicles with degeneration of the epithelium and ova and the occurrence of cysts lined by lutein cells. These cysts varied in size from a few millimeters to 4 or 5 centimeters and could not be referred back to the normal retrogression of the corpus luteum associated with the last period. There were often several such cysts and of varying ages.

A further study of 23 additional cases, with particular care in the examination of the ovaries, substantiated the previous findings. The ovarian lesion seemed to be more consistently corpus luteum cysts, some hæmorrhagic, others not, of varying sizes. It might be of interest to note that somewhat similar ovarian lesions are present in cases of fibromyomata uteri associated with bleeding.

From the clinical side it was noted that the patients who in the previous 22 cases had been almost all about 40 years of age, in this subsequent series presented a larger group under 40; in other words, women not at or near the menopause and also some young women in their teens. It is particularly for these women that a reasonable method of therapeutic procedure must be used. Medicinal treatment, i. e., the use of styptics, and general hygienic measures, have been of no avail. Minor gynecological procedures, such as curettage, have had no or only temporary success, and so a major procedure has been resorted to, usually hysterectomy, with or without the removal of the ovaries. True, this cures the condition but at a great sacrifice to the patient. The younger women are rendered sterile by the removal of the unoffending uterus and in any instance are subjected to an unnecessarily grave operation. In those cases where the ovaries are not removed the real seat of the lesion is left behind and what is done is simply to remove the possibility of a recurrence of a symptom, namely, bleeding, by the extirpation of an organ, the uterus, the sole offense of which is not that it is diseased but that it gives rise to a symptom. The roentgen treatment is more reasonable as it attacks the diseased organ, the ovary, but here too at a great sacrifice to the patient. She is rendered amenorrhœic and sterile, and as in the cases of complete hysterectomy, is subjected to all the symptoms of an artificially induced menopause.

Is there no other method that gives promise and that is not so mutilating, mutilating in a purely surgical sense in one type of treatment but psychologically mutilating in either group?

It seems, in view of the possible etiological significance of the ovarian lesion, that a more conservative treatment of these organs would be productive of good results both symptomatically and generally.

If a partial resection were done removing the cyst-bearing areas or, if this condition cannot be demonstrated on the surface, of even removing the greater portion of the functionating ovarian tissue, could we not hope for a promising result? Is it not reasonable to suppose that the disturbing symptomatology might be cured by the removal of the offending structure, and that the remainder of the ovarian tissue would if normal, functionate normally and that such a woman would neither have unoffending organs removed, be rendered sterile, nor be compelled to undergo the annoyance and dangers of a premature menopause?

X-ray treatment in these young women occasionally has no effect or exaggerates the condition. At best it may give an amenorrhœa of 1 to 3 years' duration at which time the periods return with a return of all the distressing hæmorrhage. Is it not then worth while attempting an operative procedure that may have a permanently beneficial result, at least until such time as organotherapy can be utilized with dependable and definite effects?

I have had as yet no experience with this operative procedure but hope that soon I shall have the opportunity of putting it into effect and also hope that it may sound reasonable and rational enough to be tried by other operators.

I wish to thank Dr. F. S. Mandlebaum, pathologist at the hospital, for the use of the material, and Dr. J. Brettauer for the privilege of studying the cases clinically.

LUNG ABSCESS FROM A PRACTICAL SURGICAL POINT OF VIEW

By WYMAN WHITTEMORE., M.D F.A.C.S., Boston

ALTHOUGH medical books give lobar pneumonia as the most common etiology of lung abscess, yet in my experience it has seldom if ever been the cause. The most common cause in my series has been aspiration of blood or infected matter during, or following operations on the nose and throat and the extraction of teeth. The next most common cause has been broncho-pneumonia and there has been a rare case from septic enfarct. I have been impressed with the fact, in hearing and reading surgical papers on this subject, that so little has been said about the diagnosis. The impression that I have gotten from these papers is that the diagnosis is very simple and this is quite contrary to my beliefs, as I think that the diagnosis of a lung abscess is in many cases a most difficult one to make. I wish to go into this quite thoroughly from the point of view of the surgeon.

It is of the utmost importance to make a definite diagnosis before operation, and I believe that it can be made in the majority of cases. I do not care to take up those cases that are rather acute, which develop following or during a pneumonia, while the patient is in the hospital and under expert observation, as their diagnosis is comparatively simple, but rather the more common case that I see, which comes into the hospital 3 or 4 months or even 6 months after having some lung condition.

The three most common conditions in which a differential diagnosis must be made are: lung abscess, bronchiectasis, and a small encapsulated or interlobar empyema. The prognosis is very different in each condition, and therefore I again repeat that it is necessary to know which condition one is dealing with before operating.

If one drains a small encapsulated empyema, the outlook is very good for curing the patient. If one drains a lung abscess the outlook is fairly good for getting a permanent cure. On the other hand, if one drains a bronchiectasis there is absolutely no hope of curing the condition and it is well to know this before operation, both from one's own point of view and from that of the patient.

There are four examinations to be made in each case and it is well for each one to be made by an expert in each line.

1. THE HISTORY

There are certain cases in which almost anyone can obtain a history. These are the cases that follow aspiration. But the difficult cases are those which have had some lung infection 3 or 4 or even more months previous to coming into the hospital. For instance one may get a history that goes consistently with a sudden pneumococcus infection that might tend to throw evidence toward an encapsulated empyema that had gone unrecognized and untreated until it suddenly broke through into the lung and bronchus. Or one may get a history that would be consistent with an influenza bacillus infection of the lung and this would tend toward a bronchiectasis condition.

2. SPUTUM EXAMINATION

The sputum examination is a most important examination and one that surely must be made by an expert. Of course the first condition to be ruled out is tuberculosis, and I believe that the sputum should be examined many times before one should be satisfied that there are no tubercle bacilli. If elastic fibers are found, one does and should believe the condition to be in all probability a lung abscess. Unfortunately, in my experience, elastic fibers have been found in rather a small percentage of cases; I should say in not more than 3 or possibly 4 cases out of 10. If there are large numbers of influenza bacilli found, one can be practically sure that the condition is a bronchiectasis. Of course, in all three conditions, there will be found many other organisms, such as staphylococci, streptococci, and broken down pneumococci.

3. X-RAY EXAMINATION

The X-ray examination is probably the most important examination of all from the surgeon's point of view, as it not only makes the diagnosis in many cases, but also pretty definitely localizes the process. If the X-ray shows a definite cavity with a fluid level in it, then there is no question but that the diagnosis is lung abscess, and I believe the patient should be operated upon. If, on the other hand, the X-ray shows a definite shadow but no fluid level, then I hesitate a good deal about operating, as I believe the condition may be a persistent unresolved pneumonia or a small localized bronchiectasis. At the present moment I think there is such a thing as an unresolved pneumonia, whereas a few years ago I did not think so.

4. THE PHYSICAL EXAMINATION

I have put the physical examination last as I believe this examination is the least important of the four, because in so many cases this examination is so indefinite. Of course in a few cases one finds all the classical signs, but in my experience these cases are few and far between. In some cases there is nothing found but a little dullness or a few râles or both; indeed, in one case there was nothing discovered on physical examination and yet a lung abscess was found and drained at operation.

If the man who is going to do the operation will carefully consider these four examinations and weigh the evidence, I think he will have a very good idea before operation just which condition he is dealing with.

Having made the diagnosis of lung abscess, what is the correct treatment for it? Should one operate on all cases of lung abscess? We know that somewhere between 6 and 10 cases out of 100 get well without operation. We also know that there are very grave dangers hanging over the patient if we do not operate. There is danger of the infection spreading and there is danger of a brain abscess developing and of course danger of a general septicæmia or pyæmia. It seems to me a very important and very delicate decision to make as to whether or not one should operate immediately. Sometimes the patient is in such desperate condition that the surgeon knows that any surgical procedure will surely kill the patient and then he can wait 24 hours with a clear conscience. Perhaps at the end of 24 hours the patient is a little better and then he can again put off operation. This happened in one case that I saw recently and operation was put off each day and the patient finally got well without operation. But this is the exception to the rule. I believe that it is justifiable in some cases to put off operation a few days to see whether or not the patient will improve. This applies to the acute cases; probably all chronic cases should be operated on. As a general rule, I believe all cases of lung abscess should be operated upon unless there is some good, definite reason for not operating on them.

TECHNIQUE

The operative technique is one in which there is a certain amount of controversy. However, this may be of rather minor importance and probably each man will and naturally should stick to that technique which has given him the best results. There are some surgeons who stick a long needle through the chest wall and into the lung before operating. I have never done this and never intend to do it, as I see little to be gained by it and a certain amount of danger to be feared from it. This technique is very old fashioned surgery and was done years ago for diagnosis purposes before medical men could make as definite a diagnosis previous to operation as is now possible. One certainly does not do it now-a-days in order to make a diagnosis as that is or should be made by the previously spoken of methods. I do not believe it is necessary in order to localize the process. The process can be and is localized by the X-ray and also by physical signs. If aspiration is done and the lung abscess is not found, surely operation should not be abandoned because one could not find the abscess with a needle. In aspirating in a blind way, one may go through a place where the lung is not adherent to the costal pleura, as it is difficult to tell before operation whether or not the lung and the costal pleura are adherent in every case. One may be able to guess, but

only guess, in many cases. Indeed I have seen cases at operation in which it was most difficult to tell whether or not the lung and costal pleura were adherent. If the puncture happens to be made where the lung and pleura are not adherent there is danger of infecting the pleura, making an empyema and also of making a pneumothorax. There is also danger of puncturing a large vein in the lung and if any large vein at the root of the lung is punctured I am sure that it means death from hæmorrhage, as there is no way in which to control it. If anyone has ever seen a case bleed to death from the use of the aspirating needle, either on the operating table or soon after the operation, I do not believe they would ever use it again. I will not even use it with a window of the chest wall open and the lung in front of me.

Operation. There probably is no question but that the two-stage operation is the safest procedure to use. But unfortunately by the use of this method the abscess is not found in some cases. In this technique at the first stage a window is opened down to the pleura and if the lung and the costal pleura are not adherent they are made so, this being accomplished either by suture or by packing a gauze sponge against the pleura and leaving it there for 2 or 3 days. The danger of suture is that one may make a pneumothorax, and thereby partially collapse the lung, which will, of course, defeat what one is trying to do; namely to get the lung adherent to the costal pleura. At the second operation, which may safely be done 2 or 3 days after the first stage, one has only this very small area, where the lung and the pleura are adherent, to work through. If the abscess is directly under this field, it is a very simple matter to drain it. On the other hand, if the abscess is not very close to this field it will probably never be found. It seems to me, therefore, that there is one time to find the abscess and that is at the first operation. The first thing to do after opening a window down to the pleura is to inspect the pleura to determine whether or not the lung is adherent. In many cases this is very easy to determine as the presenting pleura is thickened very much. If this is found to be the case one can proceed and hunt for the abscess. On the other hand, if the lung is seen moving under the pleura the presumption is that the lung is not adherent to the pleura, in which case one should hunt further to find a place where it is adherent. As the majority of abscesses are nearer the periphery of the lung than the root, it is my belief that where the abscess is nearest to the pleura, there the lung and pleura will be adherent. I, therefore, take off a section of the rib above, or even a section of two ribs and again inspect the pleura, and in all my cases, with a rare exception, somewhere the lung and pleura have been found adherent. On going through this area I have never failed to find the abscess. On very rare occasions, especially in those cases in which the abscess is very deep seated, the lung and pleura have not been found adherent anywhere. In these cases, with positive pressure, the pleural cavity has been opened and the lobe of the lung palpated. After finding the indurated area in the lung, the lung should be sutured to the costal pleura and the abscess opened at this time or else after waiting for 2 or 3 days for adhesions to form. In cases where it seems unwise to wait on account of the patient's condition, the general pleural cavity may be walled off with wet gauze sponges, in exactly the same way one would wall off the general peritoneal cavity before opening an appendix abscess, and then the abscess may be opened.

The technique for opening an abscess varies with the operator. Some men cut through the lung with the cautery. I have always cut into the lung for about three-fourths of an inch with a knife and then explored the lung with my finger. The finger can readily tell, when the abscess is broken into, whether or not there is actual pus to prove it. In most cases one will be able to demonstrate pus, but occasionally there is a case in which one cannot demonstrate pus at the operation. In such a case, on withdrawing one's finger from the abscess cavity, a blast of very foul-smelling air will strike the operator in the face. On getting this, there is no question but what the cavity has been found and on putting a drain into this place, one can be sure that pus will be coming out within 24

hours. I have felt several times that my audience was very skeptical as to my having found the abscess, but in each case I have been able to demonstrate pus coming out of the drainage tube at the end of 24 hours.

I have always drained the abscess cavity with a soft rubber tube and placed a cigarette wick to the pleura. The first 2 days following operation are generally very stormy ones for the patient and he usually has a very distressing cough. The complications following operation that should be looked for are empyema and hæmorrhage. Empyema will be avoided if the lung and pleura are adherent in the place where one goes through into the lung. Postoperative hæmorrhage will probably best be avoided if the tube is changed often. This may be difficult to do at first, as at times it is hard to get the tube back into the right place.

How long one should drain the abscess is a very important question. I am sure that if the abscess is not drained long enough there will be a recurrence. On the other hand in draining the abscess for a long time there is always the danger of hæmorrhage. I have had one case that did perfectly for 16 days and then had a terrific hæmorrhage and almost died. It may be that the technique of making a very large opening in the lung down to the abscess and then packing it with gauze and making it heal up from the bottom is better. This is used by some men, but up to the present time I have not had a case in which I wanted to try it.

Operative results in cases in which there was one definite abscess cavity. In going over my lung cases I have thrown out any case in which there was any question of the diagnosis. Several cases in which there were two or more distinct large cavities in which the sputum pointed more toward a bronchiectasis condition than toward a lung abscess have been thrown out. This brings my series down to 21 cases in which I think there can be no question as to the correct diagnosis. Eighteen were at the Massachusetts General Hospital and 3 outside. In 3 of these cases I patiently sat by and watched them get well without any operation. One case I watched die as the patient refused to be operated on. Strangely enough in this case while talking to the man trying to persuade him to be operated on I mentioned the danger he ran of developing a brain abscess, but in spite of this he refused to be operated on. Interesting, at least from our point of view, was the fact that he did develop a brain abscess and died in about 2 weeks. These two conditions were found at autopsy.

Seventeen cases in the series were operated on. One case died. This case developed a lobar pneumonia on the opposite side from the abscess and died 4 days after operation. Autopsy proved the pneumonia and that the abscess had been drained correctly and that there was no involvement of the pleural cavity. In this series there was a mortality of between 5 and 6 per cent. Two of these cases were acute and the remaining 15 were chronic cases, the time of their original lung condition dating back anywhere from 3 to 11 months before they entered the hospital.

SUMMARY

1. The differential diagnosis should be be made before operation. This can be done in a vast majority of cases.

2. The very great majority of cases should be operated on.

3. The best time to find the abscess is at the first operation.

4. The mortality should not be unduly high if the abscess is well localized and the correct time for operation is chosen.

THE PHYSIOLOGY OF OVULATION[1]

A Preliminary Report

By S. S. SCHOCHET, M.D., Chicago

WHILE extensive researches have been made on the mechanism, the histological changes, that occur in menstruation, our knowledge is incomplete as to the exact cause of this function. There are some who look upon menstruation as a needless and useless function, which causes much discomfort and impedes woman's competitive progress. There is one school that holds the view that menstruation is a direct result of ovulation. The second view is that ovulation and menstruation are two distinct and independent functions. The third view is that it is due to a hormone present in the corpus luteum. It is for this reason that I mention the subject of menstruation in discussing the physiology of ovulation.

Ovulation includes the growth, development, and rupture of the graafian follicles.

It is generally conceded that pressure atrophy of the ovarian stroma is the chief means by which the extrusion of the ovum becomes possible. During the growth and maturation of the ovum, the cells of the graafian follicle, after increasing greatly in number, begin to disintegrate and liquefy. From then onward, due, it is thought, to the different chemical composition of the liquor, thus forming in the follicle, or the general content of the follicle, an endosmosis seems to be induced by which the liquor folliculi increases to a far greater extent than is thought possible to result from the liquefaction of the follicular cells. The follicle so distends that, following the direction of least resistance, one side of it approaches the free surface of the ovary, producing a bulging in this surface, dispersing the ovarian stroma, and thinning its tunica albuginea and the overlying epithelium (cuboidal epithelium that covers the ovary) and results in a compression of the blood capillaries intervening between it, and the surface of the ovary. Clark has shown that capillaries in the summit of the bulging are practically obliterated by the pressure. It is supposed that nourishment is thus cut off from the ovarian stroma under compression, and the stroma atrophies until its resistance is less than the pressure exerted by the distending follicle, and the content of the follicle bursts into the body cavity. The liquefying of the follicular cells having continued until the ovum is free within the follicle, the ovum is extruded into the body cavity with the discharge of the liquor folliculi.

It was conceived by the speaker that the liquor folliculi might possesses some special digestive action upon the resisting tissues thus aiding in the process by which the ovum is extruded.

Accordingly a series of experiments were made, the result of which may be of interest. The work was undertaken to determine:

1. Whether the liquor folliculi has a digestive action and if so does it possess a specific enzyme that can be demonstrated by dialysis or other tests.

2. If it possessed such action, under what conditions is it altered? Is it decreased in pathological conditions?

3. Can a quantitative estimate of its strength and amount be determined?

MATERIALS AND METHODS

Obviously only small quantities of the liquor can be obtained at best. Human material is not available sufficiently fresh and in sufficient abundance. Ovaries of the sexually mature hog (sus Scrofa) were used as these could be very readily obtained in the slaughter houses. All histological observations of these indicate, that the process of the production of the liquor folliculi in the graafian follicle and the process of extrusion of the ovum are the same as in the human; and it is logical to assume that the liquor plays the same role as in the human ovulation, and that any results indicating its physiological action in the hog must be similar to the human.

[1] Inaugural Thesis. Read before the Chicago Gynecological Society, March 19, 1920. (For discussion, see p. 200.)

In the experiments, amniotic fluid and fluid from ovarian cysts of the hog were used for comparison with the liquor folliculi and also fluid from human ovarian cysts. The liquor was obtained under aseptical conditions to avoid any error due to bacterial activity.

The technique used in this experimental work is based on the principles of the Abderhalden dialyzation reaction. Briefly summarized, it consists in (1) the preparation of the material to be tested, (2) the process of obtaining the liquor, (3) the preparation of the diffusion tubes, (4) the test, (5) dialyzation, and (6) the comparison with controls.

Pieces of muscle, fibrous tissue, and muscle were used. These were boiled in distilled water for 5 minutes, and the filtrate tested for substances reacting with ninhydrin and the biuret reaction. This was repeated until the filtrate failed to give a reaction with one cubic centimeter of ninhydrin on boiling one minute.

Schlercher and Schull No. 579 dialyzing tubes were used. These were first carefully tested with albumin to insure impermeability to it. They were boiled for 5 minutes just before each test.

In the test small quanties of the liquor folliculi were introduced into the diffusion tubes together with a small piece of muscle connective tissue and ovarian tissue, prepared as above, separate tubes being used for each test. A layer of xylene was placed upon the fluids in the dialyzer and without to prevent the growth of bacteria and to prevent evaporation.

Controls were made with exactly the same technique using amniotic fluid, normal saline, and cystic fluid, instead of liquor folliculi. The period of incubation was 24 hours, the temperature 38°C. The filtrate or the fluid surrounding the dialyzers was tested with ninhydrin and the biuret test.

The results obtained may be tabulated as follows:

	Ovarian Tissue	Muscle	Connective Tissue
Liquor folliculi	++++	++	++
Cystic fluid (small cysts) (hog)	++	+	+
Amniotic fluid (human)	–	–	–
Normal saline	–	–	–

OVARIAN TRANSPLANTATION

Small pieces of ovary were then transplanted in the anterior chamber of the eye. In these experiments the albino rat was used, and homoplastic grafts were employed. The exact technique will be given in detail in a later report. In these experiments it was possible to watch the growth of the follicles. In the rat ovulation takes place 24 hours after parturition and usually every 30 days.

In the rat demonstrated the transplant was placed 8 weeks ago. The right eye was removed after the follicles ruptured. Sections show free ova in the anterior chamber and the transplanted ovarian tissue still viable. Transplants in the liver and in the anterior abdominal wall have also been successful. A series of experiments at fertilization in these transplants is being undertaken as is a series with the intravital stains.

As the work is incomplete, certain observations only are recorded:

1. Ovulation is due to a specific enzyme, its nature being similar to the enzyme erepsin. Apparently there are other proteolytic enzymes in the liquor folliculi; also a lipase.

2. Atresia of the follicles is due to this proteolytic enzyme or enzymes.

3. That these experiments offer a rational explanation for the use of thyroid extract and corpus luteum in sterility.

The author wishes to acknowledge his indebtedness to Professor Ranson of Northwestern University for many helpful suggestions in the experiments on transplantation.

A UNIQUE, DIFFUSE, UTERINE TUMOR, REALLY AN ADENOMYOMA, WITH STROMA, BUT NO GLANDS; MENSTRUATION AFTER COMPLETE HYSTERECTOMY DUE TO UTERINE MUCOSA IN REMAINING OVARY

By DE WITT B. CASLER, M.D., F.A.C.S., Baltimore
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ADENOMYOMA, as its name implies, indicates a structure made up of muscle and glandular tissue, and has generally been regarded as a benign tumor, characterized in the main by an invasion of the muscle columns, or, as some pathologists regard it, by a "flowing in" of the glandular tissue into the crevices of the muscle bands, the glandular tissue always accompanied by a larger or smaller amount of interglandular stroma.

It may seem a presumption at the present time, in view of the vast literature on tumors of every kind, and particularly on uterine growths, to report a "unique tumor of the uterus"; but after an extensive survey of the field and after consulting a number of well-known gynecologists as well as pathologists, I feel confident that the present case is unique, not alone in the unusual pathological findings in the uterine tumor, but in the subsequent history of the case and because of the unusual ovarian cyst removed 4 years after the hysterectomy.

The present tumor differs entirely from the usual adenomyoma, as can be seen from the photographs and slides, in the fact that it is characterized by an almost total absence of glands in the mucosa, while in the walls of the uterus itself we find no glands whatever, but everywhere large, broad masses of interglandular stroma, infiltrating between the muscle columns and dividing the muscle tissue into a coarse meshwork as far as the peritoneal surface.

The structure of the tumor and the remarkable way in which the stroma has invaded from the mucosal to the serosal surface of the growth, suggests an active process of an infiltrating character on the part of the stroma and not a passive "flowing in" between the muscle columns, and at once brings up the question in cases of adenomyoma as to whether the stroma is not as active an agent in these growths as the glands and possibly a more active agent. In all of the growths which have been pictured and in all the specimens which I have examined of adenomyomata of the uterus, the glands are always accompanied by stroma, and in all of them the stroma has pushed in, a little way in advance of the glands, as if to prepare the way for the glandular tissue to follow.

Is it not possible that the stroma is really the principal agent in these growths and by gradually creeping into a small split in the muscle columns, paves the way for the gland itself to follow?

At any rate, in the present case the stroma is the active and only agent present and in a widespread and diffuse form.

The history of the case is as follows:

Miss I. C., age 39; nurse; consulted me on January 11, 1913, complaining of an excessive menstrual flow for the past 2 years. The family history is negative for tuberculosis and cancer. The patient has always been well except for the usual diseases of childhood. The cardiorespiratory history is negative. Gastro-intestinal history shows no jaundice, appetite good, digestion good, bowels regular. The urinary history shows no pain or frequency on voiding; no blood. Menstrual periods began at 14; have always been regular, profuse, lasting 6 or 7 days; without pain. For past 2 months the patient has had a practically constant flow.

About two years before admission the patient noticed that the menstrual periods began to increase in amount and duration, and that for the 2 months preceding admission there had been a constant flow. There was no pain at any time, but a great deal of weakness, due probably to the anæmia, the hæmoglobin being 50 per cent. For the past month a decided feeling of bearing-down and dragging in the pelvis had been noticed. The patient had had no leucorrhœal discharge nor bleeding between periods until 2 months before admission. There was no enlargement of the abdomen during the periods.

Fig. 1. Photograph of uterine tumor taken soon after removal. Uterus is opened anteriorly and the uterine cavity in right half is seen filled with several large, liver-colored polypi. Comedo-like areas stand out everywhere above the cut surface of the uterus, but these are not cystic and contain no fluid.

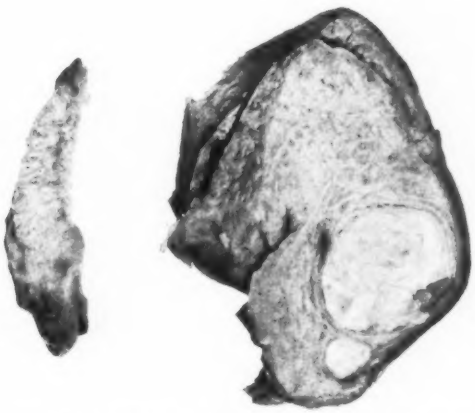

Fig. 2. Low power photograph of section of uterine tumor and polyp after hardening, showing peculiar meshwork arrangement of tissue. Light areas are muscle and dark areas are masses of interglandular stroma. Two encapsulated myomata are seen.

On examination, the abdomen was found to be normal in appearance except for a slight fullness above the symphysis, which, on vaginal examination, was found to be due to the uterine tumor.

Vaginal examination. The hymen was virginal and there was no infection. The cervix was somewhat enlarged and fibrous, but otherwise normal. Filling the pelvis and extending about two fingers' breadths above the symphysis was a fairly firm, irregular, nodular, but movable, uterine tumor. One distinct nodule could be felt in the left of the fundus. The ovaries were normal in size and there was no pelvic tenderness. In view of the history and pelvic findings a probable diagnosis was made of multiple myomata of the uterus, with one nodule, probably submucous, causing the metrorrhagia.

The patient entered the Hospital for Women and was operated upon January 13, 1913. Hospital No. 2125. The ether examination confirmed the office findings, and at operation a panhysteromyomectomy, a right salpingo-oophorectomy, a left salpingectomy, and an appendectomy were done. The round ligaments were sutured into the vaginal vault, and a small cigarette drain placed into the vagina. At operation the left ovary was normal in size and appearance and was left in, as the patient insisted this be done, as she dreaded an artificial menopause.

Before closing the abdomen the uterine tumor was opened, according to our usual procedure, and we at once found we were dealing with an unusual condition. The external surface of the uterus was smooth everywhere, but slightly irregular, due to the presence of several small interstitial myomata. The right tube and ovary were normal. On opening the tumor (Fig. 1), the uterine cavity was found to contain one large and several smaller liver-colored polypi, with a smooth surface. The mucous membrane lining the cavity was smooth and gelatinous in appearance, but not thickened. The most striking thing about the tumor was the peculiar appearance of the uterine walls. From the mucosa to the peritoneal surface, the walls were everywhere converted into a coarse meshwork by tough bands of muscle or fibrous tissue running in all directions, and in the interstices of the meshwork and standing out prominently above the cut surface were small comedo-like areas of an appearance we had never seen before. Pressure on the sides of the tumor would cause these areas to stand out even more prominently, giving much the ap-

Fig. 3. Low power photograph of polyp, showing large masses of stroma infiltrating between the muscle columns. A few gland spaces are seen in extreme tip of polyp. Note almost total absence of necrosis.

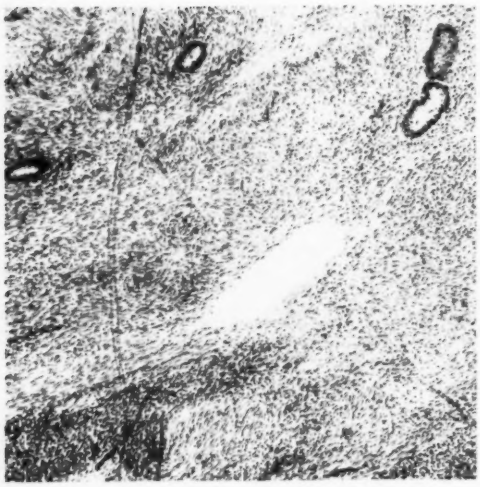

Fig. 4. Photomicrograph of section of polyp showing predominance of stroma with a few uterine glands.

Fig. 5. Photograph of section near peritoneal surface of tumor showing masses of interglandular stroma infiltrating and dividing the uterine muscle into a coarse meshwork. The total absence of glands is most striking.

pearance that one gets in a comedo carcinoma of the breast. These comedo-like areas were not friable as in a carcinoma, and contained no fluid of any kind. They were elevated above the surface, while in a diffuse adenomyoma we would have numerous depressions, with characteristic chocolate-colored fluid. We could not make a diagnosis from the specimen, and the photograph was made in less than an hour after removal of the tumor.

The specimen (Gyn. Path. No. 22897) consists of an enlarged, slightly irregular and nodular uterus, opened on the anterior surface, together with the right tube and ovary. The uterus is 13 centimeters long, 11 centimeters broad and 10.5 centimeters in its anteroposterior diameter. It is slightly irregular in contour, due to the presence of several small, firm, encapsulated nodules within its walls. Anteriorly and posteriorly it is smooth and glistening and has no adhesions. One small pedunculated myoma, 2 by 3 centimeters, is found on the left lateral surface, attached by a small pedicle. The cervix is normal in appearance, somewhat fibrous and thickened, while the cervical mucous membrane is normal.

The uterine cavity measures 8.5 centimeters in its greatest length, is smooth and gelatinous in appearance and the mucous membrane is quite thin, measuring scarcely 1 millimeter in thickness. Projecting from the upper portion of the uterine walls and filling the uterine cavity is one large, reddish polyp, and several smaller ones. The largest measures 3.5 centimeters in length and 1.5 centimeters in diameter. These polypi are all smooth and do not look malignant. The uterine walls are greatly thickened, in places 8.5 centimeters in width, due in some degree to the presence of several interstitial and encapsulated myomata within the walls, one measuring 3.5 centimeters in diameter, just above the cervix, and four smaller ones in various portions of the uterine wall. These are all firm, show no degeneration and are typical myomata with a definite capsule.

The freshly cut specimen presents a striking appearance (Fig. 2). For about 2 centimeters the tip of the large uterine polyp, when cut, has a grayish, gelatinous appearance, resembling the raw-pork look of a uterine sarcoma, and above this point we have the remainder of the polyp and all the walls of the uterus converted into a peculiar mottled appearing or coarse meshwork. Running everywhere throughout the tumor are tough, thin bands of fibrous or muscular tissue which make up the framework of this structure, while in the interstices are whitish areas, tough in consistency, from 0.5 millimeters to 2 millimeters in diameter, not friable and apparently intimately connected with the surrounding tissue, and these stand out prominently everywhere above the cut surface. There are no depressions in these areas and no secretion can be squeezed out. It is noticeable that they are present everywhere from the uterine polyp in the cavity to within 0.5 millimeters of the serosal surface of the uterus, with the single exception that they do not penetrate the capsules of the solitary myomata, which seem to be specially resistant to their infiltration, and in no place do these masses penetrate the serosal surface of the uterus.

Histologically the picture is even more striking, and at first glance resembles that seen in sarcoma, except that here we have finger-like growths split-

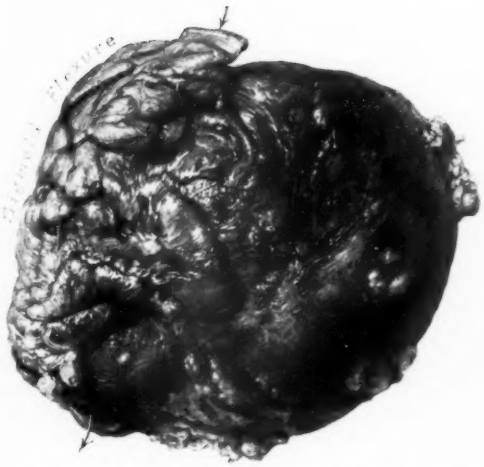

Fig. 6. Drawing of ovarian tumor and adherent sigmoid (two-thirds natural size), showing almost complete obstruction of sigmoid due to growth. Upper and lower ends of sigmoid shown by arrows.

Fig. 7. Ovarian tumor opened, showing cavity of cyst lined with many liver-colored polypi, irregular in size, generally with a broad base, each polyp made up of uterine tissue, glands, stroma, and muscle. In outer walls of cyst are numerous cystic areas, some large, some small, filled with chocolate-colored fluid resembling the spaces seen in adenomyoma of the uterus.

ting the muscle, but showing no malignant changes in its cells or otherwise.

The mucosa of the uterine cavity is only seen in a few places, and here is much thinner and more compressed than normal, and the cells are small and cuboidal from pressure. They are not swollen and generally retain their staining qualities. There are no surface depressions representing the opening of the glands. Examination of the mucosa forming the tip of the large polyp (Fig. 3) shows a greatly thickened membrane measuring 12 millimeters in thickness in places, the normal single layer of columnar epithelium having disappeared. The almost total extermination of the uterine glands is most striking, and only at rare intervals can one be found in the extreme tip of the polyp (Fig. 4). In these places the glands are much compressed, and in only one section can a gland be found which has penetrated the musculature, as in an ordinary adenomyoma, and then only for a short distance.

On microscopic examination it is at once apparent that an unusual process or overgrowth, has taken place in the interglandular stroma of the endometrium, and that beginning in the central and large uterine polyp it has gradually strangulated the uterine glands and then extended by a direct growth throughout the walls of the uterus, repeating the same process of strangulation in respect to the muscle bundles. These stroma masses consist of an embryonic tissue made up of oval and spindle-shaped nuclei closely packed together, the protoplasmic processes of the cells not being seen because of the compression. The individual stroma cells of the mucosa are slightly compressed, but otherwise normal, and show no evidence of degeneration or malignant change, and the almost total lack of breaking down is remarkable in a growth of this kind. In places one sees on the surface a few clusters of polymorphonuclear cells, and within the masses of stroma occasionally a small collection of round cells. These stromal masses are highly vascularized, containing many fair-sized arteries and thin-walled veins. Within the stroma covering the surface of the polyp there is a marked diapedesis of red blood cells giving the appearance of a premenstrual endometrium.

The pathological process beginning in the polyp is really an orderly overgrowth of the stroma, which has gradually exterminated the uterine glands by strangulation, and then in the same manner has attacked the uterine musculature. At first the stromal masses have apparently found a crevice between the muscle columns and have pushed in here, gradually extending in all directions to the serosal surface of the uterus. The process here, again, is one of strangulation, for we find in many places broad stromal masses with a small island of muscle in the midst, the muscle apparently squeezed out of existence and showing by its staining properties a beginning degeneration, but no necrosis, due probably to the extensive vascularization of the tissue. The invasion of the stroma, as a rule, has taken place parallel to the muscle columns, splitting the uterus into a coarse meshwork, but in many areas we find the stromal bands attacking the muscle columns at right angles, filtering through a weak-

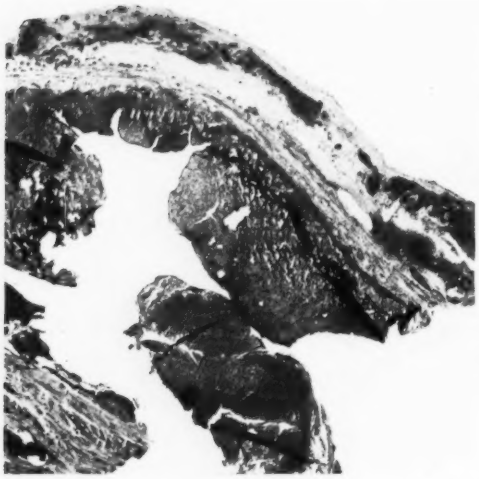

Fig. 8. Low power photograph of section of ovarian cyst wall, showing many polypi lining the cavity, each polyp made up of normal appearing stroma, but without glands, and covered by a single layer of high columnar surface epithelium.

ened spot, and then spreading out in both directions, with a pincer-like process, until the muscle is surrounded and nipped off.

The stroma, in the more recent part of the growth toward the serosal surface, is also this same embryonic type of tissue, with masses of oval and round

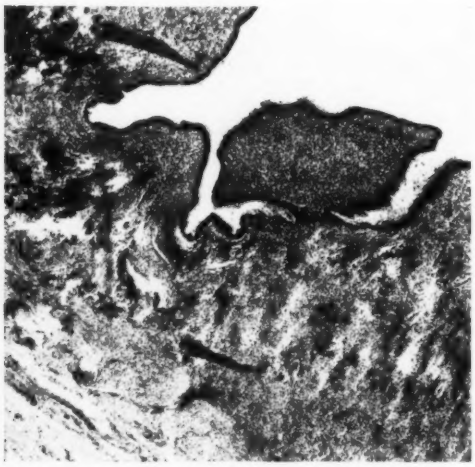

Fig. 10. Low power photograph of polypi of ovarian cyst, showing framework of stroma but no glands and single layer of surface epithelium.

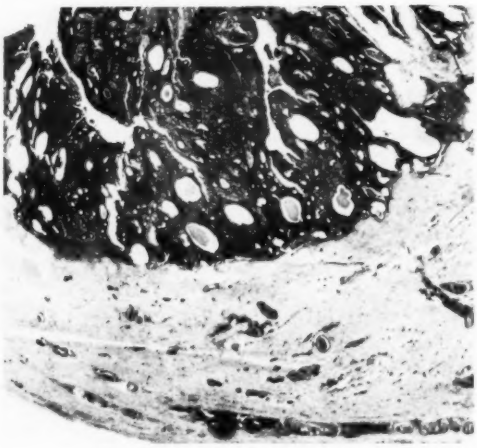

Fig. 9. Section of ovarian cyst wall, showing masses of stroma but with many large atypical uterine glands, many of the glands filled with degenerated blood.

nuclei (Fig. 5). Here the growth is not so compressed and the individual cells can be made out with their protoplasmic processes firmly attached to the nearest muscle cells or columns. In places it is very difficult to distinguish between stromal and muscle cells except by the more intense staining powers of the stroma.

This process of infiltration of the muscle bundles and the subsequent strangulation has met with no resistance except in the region of the encapsulated myomata, and here the dense, tough capsule has seemed successfully to prevent the entrance of the unusual stromal growth. This growth from its beginning in the mucosa has involved, diffusely and by direct continuity, all the walls of the uterus, and is then a connective-tissue tumor, starting in the interglandular stroma, with all the characteristics of an adenomyoma but without glands, apparently non-malignant but definitely infiltrating, a type we have hitherto not seen.

The subsequent history of this case is most unusual. Although the picture was not that of a malignant tumor, this growth was so unusual in its characteristics that the patient was watched very carefully and reported at intervals of 3 or 4 months for a period of 4 years. On each occasion the pelvic findings were normal; the left ovary was normal in size and not enlarged or tender. During this period of 4 years the patient consistently maintained that at regular monthly intervals she menstruated for a part of one day each month. Just as constantly I assured her she must be mistaken, for a panhysterectomy had been done and menstruation was out of the question.

The patient was last examined in July, 1916, and everything found normal. On January 1, 1917, exactly 4 years after the hysterectomy and 6

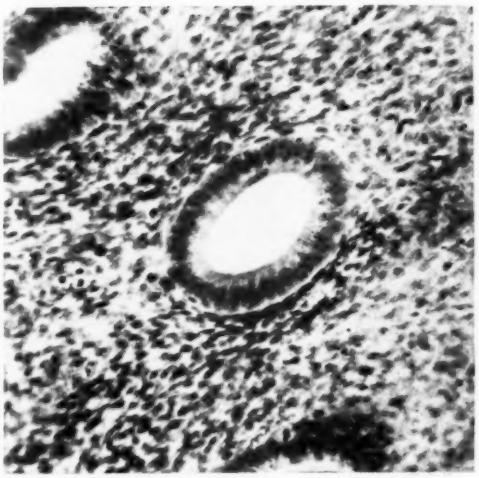

Fig. 11. High power photomicrograph of section from wall of ovarian cyst showing normal stroma and oval glands with a single layer of high columnar epithelium.

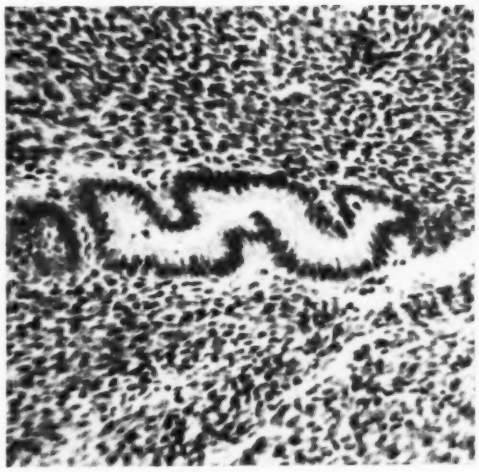

Fig. 12. High power photomicrograph of section from wall of ovarian cyst showing stroma and tortuous gland cut lengthwise.

months following the last examination, she again consulted me in regard to her condition. Everything had been as usual until 6 weeks before, in November, 1916, when the patient noticed that she had obstinate constipation, with rather flattened stools, and this was followed by a period of diarrhœa. For 2 weeks previous to the second admission there had been severe cramp-like pains in the middle and slightly to the right side of the abdomen, and, as she volunteered, as though from a partial obstruction. This was not accompanied by nausea, but there had been some slight loss of weight. Examination at this time showed a definitely distended loop of large intestine in the middle line of the abdomen, with well-marked peristalsis and distinct gurgling, and apparently an hypertrophy of the upper portion of the bowel.

On vaginal examination the old drainage tract in the upper vaginal vault had opened slightly, and through this tract could be felt an irregular, nodular, but cystic mass in the region of the left ovary. This was slightly movable and was evidently the cause of the partial obstruction of the bowel. It was thought we were dealing with a malignant ovarian tumor, and at once we thought of a late recurrence of the original tumor in the ovary.

The patient entered the Hospital for Women (Hist. No. 6434, Gyn. 1001) and was operated upon January 3, 1917. At operation a semicystic tumor, about the size of a grapefruit, was found occupying the left lower portion of the pelvis. Over the top of this cystic mass, and firmly attached to it, and almost completely obstructed by it, coiled the sigmoid flexure and the upper portion of the rectum, displaced by the growth toward the right. The ovarian tumor was densely adherent to the lateral wall of the pelvis, was extremely vascular, and there was a marked infiltration of the bowel wall. The bladder was adherent over the anterior surface. It was found necessary to remove about 20 centi-

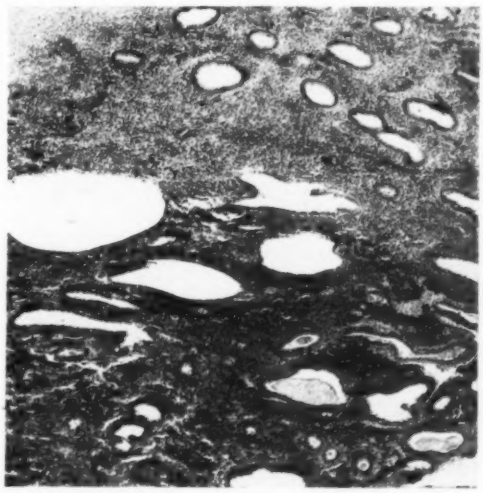

Fig. 13. Low power photograph of section of ovarian tumor, showing in one area fairly normal uterine glands and stroma and in adjacent area large, dilated, atypical glands and dense stroma. Glands in places seen filled with degenerated blood.

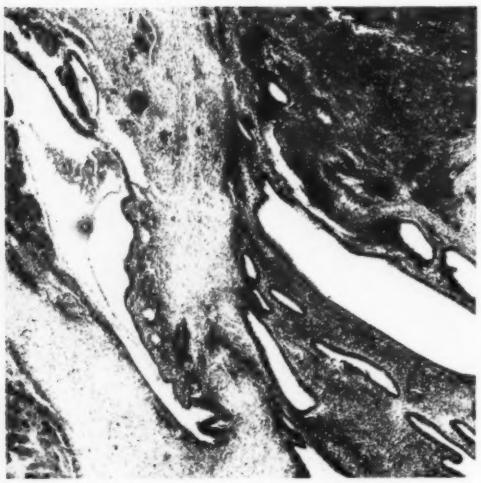

Fig. 14. Masses of stroma cells, irregular and dilated gland spaces, with single layer of high columnar epithelium and masses of muscle tissue from ovarian cyst wall.

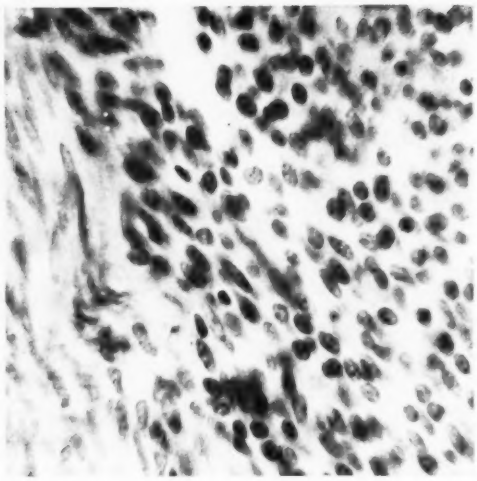

Fig. 15. High power photograph of stroma from ovarian cyst wall. Stroma cells seen cut in cross section and some lengthwise.

meters of the sigmoid and upper part of the rectum with the ovarian tumor, and an end-to-end anastomosis was done (Fig. 6). The outer portion of the ovarian tumor was so adherent to the pelvic wall that it was freed with difficulty, and during the removal the cyst was ruptured. When the rupture took place several ounces of dirty, chocolate-colored fluid and several reddish, liver-colored polypi escaped.

For 10 days the patient made a good recovery except for a slight infection of the abdominal wound, but on the tenth day was seized with a severe attack of abdominal pain, nausea and vomiting, and died from what was apparently a mesenteric thrombosis. No autopsy was permitted. The ovarian tumor removed at the second operation is also unusual.

The gross specimen (Gyn. Path. No. 22897½) consists of an ovarian cyst of the left ovary, about the size of a grapefruit, filled with chocolate-colored fluid resembling old blood, the cyst having a slight tear on the left and outer surface, while to the inner and right side is attached the sigmoid, which curves over its surface. The tumor measures 16 centimeters by 14 centimeters by 12 centimeters while 20 centimeters of sigmoid has been removed. The outer surface of the cyst is purplish in color and everywhere covered with adhesions. The sigmoid is closely attached to the growth and the lumen of the bowel is almost shut off at its middle portion by the encircling tumor. The mucosa of the bowel is normal while the muscular walls above the obstruction are somewhat hypertrophied. On opening the ovarian growth (Fig. 7), we find a cystic tumor with walls of varying thickness. In the region near the attached sigmoid the walls are quite thick and cartilaginous, measuring 4 centimeters, while in other portions they are much thinned out and are 2 to 3 millimeters in thickness. The walls present an unusual appearance. In that portion adjacent to the sigmoid which forms the thickest portion of the tumor wall we find a tough and cartilaginous tissue, yellowish gray, and gelatinous in appearance, with many small cystic spaces from 1 to 2 millimeters in diameter, containing a clear, straw-colored fluid. In other portions of the wall we find numerous small and several large loculi, connecting by small openings in their septa with the large central cavity of the cyst. The largest of these loculi shown in the drawing measures 3.5 centimeters by 2 centimeters in diameter. The inner surface of these smaller cystic areas corresponds in appearance to the interior of the large cyst. The main cavity of the tumor measures 11 centimeters by 7 centimeters by 6 centimeters. The interior of this cavity, like that of the several loculi connecting with it, is lined by a pinkish membrane with a smooth surface, but thrown up everywhere into folds (Fig. 8) and polypoid-like masses, very much resembling in appearance the polyp found in the uterus 4 years previously. These polypi have a broad base and vary in length from a slight elevation of the surface membrane to some which are 3 centimeters in length. Several polypi which had become completely detached from the surrounding wall were floating free in the cyst and escaped during its removal. Histologically, this ovarian tumor presents an unusual and varied picture depending on the portion of the wall from which the sections are taken.

Microscopic examination at once reveals that we are dealing here with an ovarian cyst made up almost entirely of uterine tissue (Fig. 9), the interior of the cyst corresponding to the uterine cavity and filled with blood while the walls contain many normal glands and others which show glandular dilatation. A pathological change has also occurred and we have an overgrowth of the interglandular stroma (Fig. 10), much resembling that seen 4 years previously in the uterus.

The walls of this cystic tumor are composed, for the most part, of more or less normal ovarian stroma, embryonic connective tissue, with here and there a well-defined bundle or column of smooth muscle. In places the tissue is much compressed and in others œdematous. Very few of the normal ovarian elements can be found, but one occasionally finds in the wall a graafian follicle.

The cavity of the large cyst and that of the several connecting loculi are filled with old degenerated blood, desquamated and degenerated epithelial cells. The entire cyst, or uterine cavity, as it really is, is lined throughout by a single layer of tall columnar epithelium of the uterine type (Fig. 10), and in places cilia can be made out.

The nuclei of the surface epithelium are centrally placed and are oval and vesicular. Directly beneath the surface epithelium is a well-defined basement membrane, separating it from the normal interglandular stroma. Sections from the thickest portions of the cyst wall give the exact picture of a normal endometrium of the premenstrual type. We find normal-appearing uterine glands in large numbers (Fig. 11), oval in cross-section and wavy when cut longitudinally (Fig. 12). These glands open, for the most part, into the central cavity of the cyst. In places certain of these glands are found filled with a substance resembling colloid (Fig. 9). In other places, from the cyst wall we find areas where the uterine glands are much distorted (Fig. 13), greatly dilated, and resembling a typical glandular dilatation. In still other sections from the thinner portions of the cyst wall the histological picture greatly resembles the specimen of the original tumor (Fig. 14). The lining membrane of the cyst is seen thrown up into many polypoid-like masses (Fig. 10), each with a broad base, the surface covered with normal uterine mucosa, but with a total absence of glands. Beneath the mucosa in these areas we find an interglandular stroma of varying density, but apparently of a normal type, with closely packed oval and spindle-shaped nuclei and highly vascular. Everywhere in the stroma there is a marked diapedesis of red blood cells throughout the endometrium. The uterine glands show no tendency to invade the underlying musculature, but in those areas where we find masses of stroma unaccompanied by glands, we see the same tendency on the part of the stroma to infiltrate and strangulate the muscle as in the original uterine tumor (Fig. 10). The musculature of this tumor lies directly beneath this endometrium and is made up of several well-defined, interlacing bundles or columns of smooth muscle tissue. These muscle columns are normal when underlying the glandular portions of th growth, but become degenerated when invade by the stromal masses (Fig. 15).

The mucous membrane of the intestine is normal and the muscular coats of the bowel have not been invaded, but this infiltration of the tissue has gone around the sigmoid, so that for fully one-half of its circumference it is surrounded and compressed by this growth, thus causing the almost complete obstruction.

These two specimens, the one a diffuse adenomyoma of the uterus without glands, the other a large uterine growth of the ovary, are interesting not only from the menstrual history accompanying them, but from their morphological structures, and bring up many interesting queries as to their etiology.

From the time in 1896 when von Recklinghausen's (1) work on adenomyoma appeared and when at about the same time Cullen (2) published his observations, a violent controversy has been waged in regard to the etiology of adenomyomata of the uterus. It is not necessary to review the vast literature and many theories that have been evolved, for nearly every pathologist has taken some part in the discussion. It is mostly due to the work of Cullen that nearly all investigators at the present time are agreed that the great majority of cases of adenomyomata of the uterus have their origin from the uterine mucosa. The present specimen from the uterus bears out Cullen's theory, as the process can be plainly seen beginning in the stroma of the uterine polyp, and can be traced directly for a considerable distance throughout the walls of the uterus, in many places nearly to the serosal surface.

In regard to the history of regular menstruation in this case following the hysterectomy, surgeons have long recognized that when portions of certain organs are removed there is a corresponding hypertrophy and functioning of the remainder, and it is a natural process then that the uterine glands in the ovarian cyst should take on the active work of the uterus and maintain menstruation regularly. But it is a decided matter of wonder as to just what the stimulus might

be that would start up, after three and a half years of apparently normal functioning, an active hypertrophy of the uterine tissue in the ovary, so that in less than six months, under careful observation, there should have developed a cystic tumor the size of the present one.

The etiology of the ovarian tumor, however, is not so clear. We are dealing in the second tumor with an ovarian cyst, containing uterine tissue, muscle, glands, and stroma, the stroma resembling that of its prototype in the uterus. We are not then dealing with a teratoma of the ovary, for no other structures are seen, as we would most certainly find in a teratoma.

It has long been known that at rare intervals, ovaries have been found containing a small collection of uterine glands and stroma.

Russell (3), in 1898, published a report of "Aberrant Portions of the Muellerian Duct Found in an Ovary," and in his case demonstrated clearly an anomalous development of portions of the muellerian duct in germinal epithelium.

That certain of the ovarian tumors may originate from wolffian remains in the hilum of the ovary is probable and Olshausen and Doran have supported this view in regard to the origin of papillomatous tumors. On the other hand Williams (4) has shown in his paper on "Papillomatous Tumors of the Ovary" that epithelial growths may arise independently of wolffian remains.

Waldeyer (5) came to the conclusion that nearly all of the ovarian tumors originated from a proliferation of the surface epithelium of the ovary, while it has been clearly demonstrated by Marchand (6) that there may at times be an extension of the epithelium of the fallopian tube which by its down growth gives rise to cystic structures in the ovary.

Dr. Welch recently suggested in looking over these specimens that portions of ovarian tissue might be found on careful search in the uterus, as well as uterine tissue in the ovary, a suggestion based on the wolffian theory of von Recklinghausen (1) that when the wolffian and muellerian ducts cross in early fœtal life, there may be at times an intermingling or confluence of these tissues. Examination of the uterine specimen, however, does not show any evidence to support this suggestion. While we have no conclusive proof in this case that this uterine tissue in the ovary originates from remains of the muellerian ducts, we do know that such cases have been clearly proved and we are further strengthened in our opinion of the muellerian origin of the growth by the fact that the same pathological change or overgrowth of the stroma has taken place in the ovarian tumor that occurred in its prototype in the uterine stroma.

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Discussion by Charles C. Norris, Philadelphia

Dr. Casler's case is an extremely interesting one. Embryonal rests in the ovary are by no means common and inclusions of muellerian tissue are extremely rare. Some years ago W. W Russell, reported the history of a case in which one ovary was the seat of a neoplasm and the other although, macroscopically, practically normal was found on histological examination to contain a considerable amount of endometrium. A picture of this specimen has been incorporated by Hurdon in her chapter on "Gynecological Pathology" in Kelly and Noble's *Gynecology and Abdominal Surgery*. I have had a very similar case.

Two years ago this summer a young woman, twenty-nine years of age came to me suffering from a pelvic inflammatory disease, for which operation was advised. A curettage, bilateral salpingectomy, left oophorectomy, and appendectomy were performed. The tubes presented the usual appearance of small hydrosalpinges. The ovary showed a number of adhesions and was slightly enlarged, the enlargement being due to a graafian follicle cyst, which was situated in the outer pole of the organ and constituted about one-third its bulk. A normal corpus luteum was also present. On opening the ovary nothing further was noticed,

but when the histological sections came through, an area of endometrium was found. This was situated in the center of the organ and about 6 to 8 millimeters from the periphery. It was about 6 to 7 millimeters in diameter, and consisted of a small cystic space containing a little free blood; this space was lined by endometrium which was identical to that of the uterus. It was about the thickness of the normal endometrium. The endometrium rested upon a narrow zone of unstriped muscle similar to that of the normal myometrium. Although there was apparently no exit from this cystic space the latter was not entirely filled with blood and the lining endometrium showed no evidence of intracystic pressure, such as is so common in some of the pinched off glands found in ordinary uterine adenomyomata. The endometrium in the ovary was similar to that removed from the uterus by curettage and was of the same periodicity, that is, both were of the interval type, as described by Adler and Hitchmann. The fact that the endometrium in the ovary, although encapsulated and evidently functionating, and that no exit from the cyst could be detected, and that it showed no evidence of intracystic pressure, suggests that perhaps at certain intervals this small space may have ruptured on the surface of the ovary like a graafian follicle and again healed over, this process repeating itself at certain periods. However, histological examination failed to show scar tissue, such as might be expected to be present if such had been the case. This possibly is of interest in its bearing upon Dr. Casler's case, in which case you will remember a panhysterectomy had been performed and menstruation presumably from the ovary occurred through a sinus. Presuming that this was a true menstruation and not a mere bleeding from an inflammatory area, it is possible a small rupture may have occurred in the wall of the ovarian cyst each month, just as a graafian follicle ruptures at such periods, and such ruptures being followed by an escape of blood through the sinus into the vagina. Indeed, this appears to be the only way in which a true menstruation could have occurred, as I gather from the description of Dr. Casler's case that the endometrium-bearing area was confined to the inner surface of the specimen. My case was very similar to Russell's, except that in his a tumor was present in the opposite ovary, while in mine the opposite ovary was, macroscopically, normal.

Muellerian inclusions in the ovary bring up the question of such rests being the starting-point for ovarian neoplasms. Thus in Russell's case we have no knowledge of whether or no the neoplastic ovary originally contained muellerian tissue. In Dr. Casler's case, however, it is very evident that it did, and if we accept the ovary in his case as being the seat of a true tumor and not merely a large retention cyst, such as sometimes develops in conserved ovaries, due to defective blood supply, a rather strong case might readily be made out for the theory of such rests subsequently developing tumors. The fact, however, that ovarian tumors are common and muellerian rests in the ovary very rare seems to disprove such an assumption, for were rests a regular developing point for tumors they should be more frequent than are the latter, whereas they are far more rare. In my case the opposite ovary was, macroscopically, normal, and 18 months after operation the patient was well.

LATE HEREDITARY SYPHILIS

Membranous Pericolitis, Perienteritis, or Chronic Abdominal Syndrome

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AND
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Surgeon, Parmenio Pinero Hospital

SINCE Jackson in America, Lane in England, and Wilms in Germany created this new chapter in abdominal pathology by their clinical observations and research, a vast and modern medical and surgical bibliography has been made despite the short lapse of time—a decennial—since the first publication of Jackson. Including within this conception of the "chronic abdomen" some facts previously known and studied in France, especially by Glénard in 1889, numerous physicians and surgeons have studied eagerly the subject—an old acquaintance of theirs brought up to date by the Anglo-Americanism of the twentieth century.

We do not intend to make a synthetical study of the bibliography, but only to cite the most modern works among English, French, and American authors, without forgetting, to be sure, those of Argentine. Many of the works cited (Lane, Sorrel, Leveuf, etc.) are studies of membranous perienteritis and chronic abdominal syndrome, in which, after an historical review, the authors enter into the study of the etiology, pathogenesis, pathology, symptomatology, diagnosis, prognosis, and lastly the surgical treatment, with differences only as far as the operative process to be employed is concerned. In none of the numerous works reviewed have we found mention or even suspicion of syphilitic etiology, either under the form of acquired or hereditary infection. Lane praised mercurial preparations for their efficacy without suspecting a syphilitic etiology. Most of them analyze and criticise the various theories of pathogenesis of the membranes and their connection with the gastro-intestinal disturbances and their effect on the general condition. The theories of pathogenesis which have been best received and on which are based the different operative procedures, are the mechanical theory of Lane, the congenital theory of Mayo, and the inflammatory theory of Jackson.

It is not our intention to discuss in detail these various theories, but we do wish to express our absolute disagreement with Lane's mechanical theory (1). We believe that the theories of Mayo and Jackson contain a certain amount of truth, but we also wish to call attention to the fact that Jackson, in speaking of the inflammatory origin of this condition does not mention the cause of the infection producing the inflammation, a cause which, in many cases, is obscure and at times closely related to hereditary syphilis.

We give below a comprehensive series of medical and surgical clinical observations, which, although the number is not large, are typical and prove a fact hitherto not mentioned; that there is a relation between hereditary syphilis, perienteritis, and the chronic abdominal syndrome. These cases have been referred to on previous occasions (3).

Our material is divided into two groups according to whether the patients have been studied from an exclusively medical point of view or with surgical control. The first group of observations contains purely clinical material and the diagnoses are supported by careful radiological examinations made by noted specialists whose reports and roentgenograms are shown below. The clinical history will be followed by a clinical commentary on the etiology, pathology, and therapeutics.

The second group comprises the medico-surgical material or those cases in which surgical intervention has permitted an observation of the nature of the lesions. These cases are highly illustrative of the efficacy of the surgical and specific medicinal regimen.

CLINICAL OBSERVATION

CASE 1. A. D., age 28, married at 19. The wife has not become pregnant and is suffering from hereditary infection, with acute dysmenorrhœa and numerous dysendocrine and gastro-intestinal symptoms which were relieved by specific treatment. The father died at the age of 43, from liver disease, the exact nature of which the patient cannot specify. The mother died at the age of 66, of cancer of the breast. She had had 12 pregnancies, 9 of which had ended in abortions or stillbirths; one son died at the age of 10; two are living adults, one of whom is the patient in question. The patient had had measles, whooping cough, and jaundice while a child. At the age of 28 he had a second attack of jaundice. As far back as he can remember from earliest childhood until 26 years of age, he has suffered from headaches and has always been constipated. To overcome this, it has always been necessary for him to use laxatives and strict dietetic measures which became finally ineffective. At the age of 24, the patient suffered, for 24 hours, from an acute attack of diarrhœa. From the age of 26 on, he has had very intense paroxysmal attacks of epigastralgia, at which times the tongue became thickly coated. There were acid eructations, very intense meteorism, a sense of obstruction and pain in the right half of the abdomen, cardiac arrythmia, and at one time a paroxysm of transient tacchycardia. In spite of the varied medical treatment, the gastro-intestinal disturbances have increased in intensity becoming more pronounced in the evening, and greatly exaggerated in the summer.

Physical examination, June 17, 1918, showed the following: premature baldness, inequality of pupils, premature loss of teeth accentuated by intense caries, pronounced aortitis, generalized arteriosclerosis, distended abdomen with tenderness over cæcum and ascending colon, bilateral hydrocele with left varicocele, roughening and bowing of shin bones and generalized adenopathy. Because of the family history of so large a percentage of abortions and stillbirths, hereditary syphilis was considered, and this was confirmed by the numerous tertiary stigmata found in the patient. To hereditary syphilis, we attribute the aortitis, premature arteriosclerosis, the double hydrocele and pluriglandular dysendocrinism, hypothyreosis, and hypoepinephry. We regard the intestinal disturbances and chronic constipation as a result of right cæcocolonic pericolitis.

Professor Alfred Lunari made a radioscopic examination of the digestive apparatus which showed a slightly ptotic stomach with rather lowered tonus but with rather good peristalsis; a normal pylorus and duodenum, and without retention after 6 hours. There was no localized pain, the cæcum was spastic. There were adhesions in the region of the right colic flexure. The transverse colon was apparently normal. Roentgen diagnosis was: perityphilitis and right pericolitis with a tendency to intestinal spasm.

The patient was subjected to treatment for 1 month with Van Swieten's solution, with the following results: improvement in general condition; marked diminution of headaches; daily evacuations of the bowels, spontaneous but slight; fair appetite.

On physical examination we found a greatly reduced meteorism and less pain in the right cæcocolonic region. Treatment with injections of gray oil was begun and a series of 10 injections of 0.10 centigram each were given. As this mercurial treatment was continued, the following modifications were noted: The patient's general condition improved; the tongue gradually cleared up; the spontaneous pains disappeared as did pain on palpation of the right half of the abdomen; intestinal evacuation became easier and more abundant. On conclusion of the treatment with gray oil injections which yielded such good results, iodine was prescribed for a month, but treatment could not be continued because of the manifest intolerance on the part of the patient. Later, a monthly treatment extending over 12 days, by means of gray oil suppositories was prescribed. This was carried out by the patient during the four months, November to March. Throughout this period calcined magnesia was given fortnightly by our prescription, in doses of a teaspoonful every fortnight. The patient's general condition could not be better; the abdominal examination was negative, the patient had a good appetite and his bowels voided naturally every day. The double hydrocele vanished. The dysendocrine phenomena continued to grow less.

CASE 2. T. C., age 15, Argentinian. The father is 49 years old. He contracted syphilis 6 years before marrying and was treated inadequately as evidenced by the wife who has had symptoms which yielded only to specific treatment. She has had one child born dead and 8 full-term children. Many of them are of sluggish temperament; one girl was operated upon for appendicitis when 14 years old. The 8 children show characteristic stigmata of tertiary hereditary dystrophic infection. The patient in question menstruated at 12, the courses being regular as to period, variable in duration, and abundant in quantity. From 10 years on, she grew slowly and progressively constipated until she became extremely costive, slightly affected by ordinary laxatives, and requiring progressively purgative doses.

In April, 1918, she had an attack of acute appendicitis for which she was operated upon within 4 hours from the onset, by Dr. Maximo Gastro. Convalescence was uneventful. The appendix was found to be very much inflamed with a small quantity of fibrinous exudate. The intestinal stasis persisted for 2 months following the operation.

On examination in July, 1918, the following peculiarities were noted: stigmata of skin, of bones, skeleton, teeth, palate, pupils, and papillæ due to hereditary syphilis. She had a marked mitro-aortitis and presented symptoms of hypothyroidism, hypo-adenia, and of vagotonia and arrythmic breathing. The abdomen was moderately distended, tense, and rather sensitive in the right half, showing a thickened and dilated cæcum. We felt justified in

diagnosing hereditary syphilis in this girl's case on the basis of the hereditary antecedents on the mother's side as well as on the father's, and on the basis of the infective dystrophic stigmata which were due to hereditary infection and to which we attributed the mitro-aortitis and pluriglandular dysendocrinisiasis. At the same time, however, we must not overlook the chronic constipation and right cæcocolonic pericolitis. Radiological and radiographic examinations of the digestive tract made by Dr. H. H. Carelli showed the following:

1. Immediately after taking the bismuth, the stomach is seen in normal position, shape, and size, although slightly hypertonic (Roentgenogram 1).

2. Six hours after swallowing the bismuth (Roentgenogram 2) the stomach is found to be empty; bismuth is seen in the lowest part of the ileum; the ileum opens into the cæcum at a slight Lane angle; the cæcum and the ascending colon are seen to be flattened, wide, smooth, and atonic, without sacculation.

3. Twenty-four hours later (Roentgenogram 3) the cæcum and the ascending colon have their previous caliber and appear chronically inflamed and dilated.

Roentgen diagnosis: colitis with pericolitis of the ascending cæcocolon.

On the basis of the above diagnosis, mercurial treatment with Van Swieten's solution was given. At the end of 8 or 10 days, the bowels began to move without the administration of laxatives. As the mercurial treatment was intensified, the evacuation of the bowels became more and more regular. At the end of a month's treatment, there were one, two, and at times even three movements per day. This continued for 8 or 10 days after the suspension of mercurial treatment, after which the bowels became sluggish again. When treatment by Van Swieten's solution had been suspended for a month, Gibert's syrup was given, with the result that the patient had normal bowel movements. In view of this result, it was decided to give the patient two more mercurial treatments, using Van Swieten's solution and Gibert's syrup, each treatment to extend over a period of a month. We hoped thereby to maintain the improvement gained. Six months have now elapsed since the last course of mercurial treatment, and the girl has, up to the present, two or three movements perfectly normal daily.

Case 3. A. G., age 26, single. The patient's father died at the age of 63, of locomotor ataxia. The mother has not been examined but is considered healthy. She has had five normal pregnancies, four daughters and one son all sickly; no miscarriages. In early childhood the patient had measles, grippe, and paratyphoid, and from early life has suffered with intestinal trouble. Because of her debilitated condition, she has undergone several courses of climatic treatment in Europe, remaining for 4 or 5 years. Her general health improved extraordinarily, and she continued to be strong and well until she was 18. From then on, she grew weak and became more and more constipated. Her appetite was poor, she had morning nausea, a nasopharyngeal catarrh which was apparent only at night; she had pains in the cæco-appendicular region, with alternating sensations of cold and heat. She slept soundly and awoke more tired than when going to sleep. Here and in Switzerland she was given numerous treatments for the nocturnal nasopharyngeal catarrh, but without avail. The patient menstruated at 12, and her courses were regular, painless, and moderately abundant, until she was 24, when they became painful, slightly irregular, scanty, and accompanied by headaches and vomiting.

Physical examination on April 19, 1918, showed a very debilitated patient with thin, colorless cutaneous cicatrices, unequal pupils (arcus senilis—Antonelli), dentomaxillary dystrophy, and a small, soft thyroid. The hands and feet were cold and rather cyanotic. There was a slight aortitis, distinct catarrh of the respiratory passages (nasotracheobronchial), and a pleural friction rub on the lower left side. The cæcocolonic region was slightly distended and painful.

Because of these findings and the evidence of syphilis on the father's side, a diagnosis of hereditary syphilis was made. To the hereditary syphilis are attributed the pluriglandular dysendocrinism of the thyroid-ovarian type, and the aortitis which were present. We saw in the tendency to catarrh of the air passages a result of hypothyroidism instead of infection, in spite of the existing dry pleuritis.

The gastro-intestinal disturbances and chronic constipation we attribute to the pericolitis of the left cæcocolon. The roentgen examination made by Dr. H. H. Carelli after the administration of bismuth mixture, showed the following:

1. Immediately after the administration of the bismuth, the stomach became slightly ptotic and hypotonic; the pylorus, second and third portions of the duodenum, and first part of the jejunum were filled with bismuth (Roentgenogram 4).

2. Six hours later (Roentgenogram 5), the cæcum and ascending colon were greatly dilated, atonic, flattened, and without sacculations. The masses of bismuth were irregularly distributed. The first part of the transverse colon was normal. In the second part of the transverse colon the bismuth masses were irregularly distributed and the physiological contour obliterated. The descending colon was normal.

3. Twenty-four hours later (Roentgenogram 6), the cæcum was considerably distended, its sacculations were rather more marked at the level of the cæcum, but in the ascending colon the sacculations were still obliterated. At the right colic flexure, a pronounced aerocoly was seen with bismuth shadows irregularly distributed.

From the roentgen examination, a diagnosis of pericolitis of the right cæcocolon and of the splenocolonic region (transverse and descending colon) was made. The patient was subjected for a whole year to alternate monthly treatments of iodine and

calomel, Van Swieten's solution, Donovan's ferrari solution and elixir biniode (Contirran). Under this treatment the patient improved gradually and progressively. After a year's treatment with the patient under strict supervision, we find that there is a lessening of the aortitis, the menstruation has become normal, that the disturbances in the respiratory passages have vanished, that there is marked improvement in the hypothyreosis, the pains in the cæcocolonic region have disappeared, and the bowels move regularly.

CASE 4. A. L., age 15, Argentinian. The father, age 45, shows signs of hereditary syphilis, together with slight aortitis and dilatation. At 42, he had an attack of serofibrinous pleurisy which was cured after two thoracocenteses. The mother, age 39, shows signs of hereditary infection. She has always suffered from enterocolitis and constipation, with "hepatic colic." Out of six pregnancies she has had four children born at term and two spontaneous abortions. A sister of the patient suffered from interstitial keratitis at the age of 6; it has left slight leucoma.

The patient in question presents no interesting data in her previous life. She menstruated at 12, the courses being regular, extremely painful, moderate in quantity, and lasting 3 and 4 days. Since early childhood she has grown slowly more and more constipated. In her earlier years mild laxatives were sufficient to move the bowels, but these became ineffective so that 2 or 3 days would pass without a movement. She often had pain in the right half of the abdomen, at which time the abdomen became distended and tense. Such periods were frequently followed by a diarrhœic crisis and a new period of constipation.

On examining the girl in May, 1918, we found hereditary syphilitic stigmata of the pupils, optic discs, teeth, and bones, together with marked symptoms of hypothyreosis, hypo-epinephry, and aortitis. The abdomen was generally distended, painful over the entire right half.

The roentgen examination was made by Dr. H. H. Carelli and showed the following:

1. Immediately after swallowing the bismuth (Roentgenogram 7), we saw a large, smooth stomach, slightly ptotic and hypotonic.

2. Half an hour after swallowing the bismuth (Roentgenogram 8), the stomach was partly emptied and we saw but few peristaltic waves. The duodenal bulb was full. All the jejunum and first portion of the ileum were filled with bismuth.

3. Six hours after swallowing the bismuth—during which time the patient's bowels had moved—(Roentgenogram 9), the stomach was seen to be empty and the cæcum and ascending colon were quite filled with bismuth. A small quantity of bismuth remained in the lower part of the ileum. The outlines of the cæcocolon were seen to be uniform, with a considerable diminution of the sacculations. In the first portion of the descending colon, the retention of bismuth and signs of pericolitis were noted.

4. Twenty-four hours after administration of bismuth (Roentgenogram 10), there was a very pronounced retention of bismuth at the level of the cæcum and there persisted a diminution of its sacculations. The cæcal end of the appendix contained bismuth. The ascending colon, the right colic flexure, and in the first portion of the transverse colon, stains of bismuth, distributed irregularly, persisted, with marked aereocoly at the level of the right colonic flexure.

Based on the data gathered from the examination of the parents and sister, atavic hereditary syphilis was diagnosed. We attributed the aortitis and dysendocrinisiasis to hereditary infection. With regard to the abdominal disturbances, we saw in them an exponent of chronic constipation with intense pericolitis of the right cæcocolon, and at the level of the transverse colon and the first portion of the descending colon.

The roentgen diagnosis was pericolitis of the cæcum, ascending, transverse, and descending colons.

Mercurial treatment by means of Van Swieten's solution was begun. The treatment was well tolerated and 8 or 10 days after beginning it, bowel movements began, first scanty, later more free, as the treatment was intensified. After a period of a month, the mercurial treatment was discontinued for a month. A second course was then begun. During the interval between treatment, constipation returned, but was relieved on resuming the second course.

Following the last treatment, the girl had an attack of acute appendicitis. About a month after the attack, she was operated upon by Dr. J. F. Molinari. The appendix was bound by adhesions to the cæcum, the cæcal region being also entirely covered by adhesions. Surgical intervention was restricted to the appendectomy. Convalescence was uneventful.

In spite of the appendectomy the bowel symptoms remained the same. Constipation continued, the diarrhœic attacks were less frequent and painful. Under the circumstances, 2 months after operation, monthly mercurial treatment by means of Gibert's syrup were begun, with pauses of 14 or 20 days between the courses.

The efficacy of the treatment was more evident in the second period, as in the pre-operative one, but the effect was no longer transient but much more lasting.

After operation the girl had four courses of mercurial treatment, and now, 2 months after the last course, enterocolitis and constipation have greatly abated. The bowels move quite regularly daily, and the painful intestinal disorders and diarrhœic attacks have been absent during the last 4 months.

We believe that the favorable outcome in this case is due to the combined surgical and medical treatment. It is interesting to note that the attack of acute appendicitis occurred

after the patient had two one-month courses of mercurial treatment.

CASE 5. F. M., age 28, married at 20, has had three pregnancies with healthy offspring and no miscarriages. The husband is healthy. The father died at the age of 63 from an unknown cause. The mother is 57 and has diabetes. She had had 11 children of whom 5 died from unknown causes. Six children are living.

The patient menstruated at 12, the periods were regular, scanty, variable as to duration, and painless. She has felt ill since she was 18 or 19 years old. The symptoms at first were heaviness in the upper abdomen, and constipation. These symptoms have slowly become intensified and have been accompanied by burning in the stomach, and frequent, acid regurgitation. Constipation has grown more intense until 3 days or more passed without defæcation, unless laxatives were taken and, although effective, the laxatives did not modify in the least the great general gastric distress and malaise.

Physical examination made on July 16, 1918, furnished the following: very thin hair, unequal pupils, dark circles about eyes, arched palate with the teeth out of alignment, small firm goiter, multiple small glands, distinct mitro-aortitis, cæcum, ascending colon, and hepatic flexure, large, thickened, hard, and painful. The pyloroduodenal region was very painful to palpation and pressure. The tibiæ were bowed. Sergent's line was unmistakable, the skin was of the myxœdematous type with diffuse pigment, particularly around the nipples and the mid-abdominal line.

Based on the numerous dystrophic stigmata, hereditary syphilis was diagnosed and to this infection were attributed the mitro-aortitis and dysendocrinisiasis (thyroid, adrenal). The abdominal phenomena were ascribed to peri-enteric origin from pericolitis of the right cæcum, colon, right flexure, and hepatopyloroduodenal perienteritis of the duodenum with vagotonia, resulting in chronic constipation.

Roentgen examination by Dr. Alred Lanari showed the following: the patient has a small, hypertonic stomach, which is highly peristaltic and empties quickly. There was no local gastric or duodenal pain. In the duodenum some antiperistaltic waves were observed. The radioscopical examination of the colon as pictured in Roentgenograph 11 showed signs of perityphilitis and pericolitis, without disturbance of the motility, except that caused by the spastic tendency of the transverse colon.

Treatment by Van Swieten's solution and iodine was prescribed. The latter had to be abandoned in a few days because of the patient's intolerance for the drug. Treatment with Van Swieten's solution was carried out for 6 weeks with the following results: less eructation, daily spontaneous evacuation of the bowels, marked relief from the headaches, subjective improvement in the general and abdominal conditions. At this time, September 14, treatment with a mixture of alkaline laxatives to be taken for 2 weeks, after which specific treatment with mercury and arsenic in suppositories, was resumed. This treatment with mercury and arsenic was continued for 2 months, after which we again saw the patient (December 7, 1918). She reported that her general condition was evidently improved: the bowels moved twice daily, she seldom had headaches, and gastric distress was much relieved. For 6 months the patient was given monthly treatments with gray-oil suppositories. The general well-being became more and more marked and the gastro-intestinal phenomena were overcome.

CASE 6. M. A., age 38, French, single entered our ward in the Durant Hospital, April 20, 1918. Her personal and hereditary antecedents were of no importance. When the patient was 7 she had diphtheria and soon after had measles; at 10, coxalgia; at 13, she had mumps, bronchitis, and dislocated right knee. She again dislocated her knee at 21 and in the winter of 1917. The patient menstruated at 13, her periods being very painful at first. At present the periods are very irregular. She suffers from rheumatism and has had several attacks of bilious vomiting. For the past 10 years she has suffered from enterocolitis and painful defæcation. At times she has noticed that her abdomen swells and becomes painful and there is a feeling of obstruction in the lower right abdominal region, and that after a time these conditions subside. She has chronic, obstinate constipation.

The details of this case are given in our work on "Articular Manifestations of Late Hereditary Syphilis (4)." Suffice it to say that this patient presented stigmata of late hereditary syphilis, as regards the skin, viscera, bones, teeth. A network of veins was present on the forehead, the hair was remarkably thin, there was inequality of the pupils, aggravated myopia, and gross lesions of the neuroretina, Antonelli's sign, strabismus, and disorders of hearing were present. She also suffered from coxitis, genu recurvatum, hypothyroidism and disorders of the abdomen, which we ascribed to the hereditary syphilis. Rectosigmoidal phenomena were studied at the same time as were the hereditary syphilis (5). Here we would enumerate the other abdominal phenomena. The abdomen was well proportioned, protruding somewhat in the lower right half, with a subcutaneous network of veins scarcely visible on the left but more pronounced on the right. The walls were of medium thickness and rather tense. The abdomen was diffusely painful to palpation and percussion, the epigastrium, sigmoidal area, ileocæcal region, and right colon being the most sensitive spots. We diagnosed chronic rectosigmoiditis and pericolitis of the right ileocæcocolon.

Roentgen examination was made by Dr. H. H. Carelli and showed the following: the cæcum is somewhat dilated, the colonic sacculations are obliterated. The enema passed the ileocæcal junction and the ileum opens at an abnormal angle into the cæcum (Roentgenograms 12 and 13).

Roentgenogram 1. Case 2, showing the stomach, shortly after the bismuth meal, slightly hypertonic, normal in shape, position, and size.

Roentgenogram 2. Same case, taken 6 hours after bismuth meal showing opening of ileum into the cæcum with slight Lane's kink. Cæcum and colon full, smooth, atonic.

On the roentgenological findings a diagnosis was made of typhlocolitis with partial colitis of the descending colon. Specific treatment consisting of the endovenous administration of enesol followed by gray oil was prescribed. The effect upon the patient both as to her general condition and specific ailment was quite remarkable; the headaches vanished, the languor, palpitations, and gastro-intestinal disturbances gradually grew less until the pains and painful seizures in the right lower region disappeared completely, and evacuation of the bowel became regular.

During the year that we have had this patient under observation, the very favorable change effected by the first course of mercurial injections gradually improved.

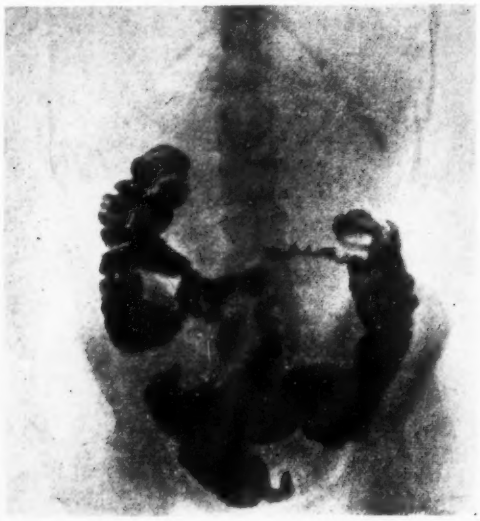
This first group of clinical observations is composed of a series of individuals, youths and young adults, suffering from chronic constipation and membranous peri-enteritis. In the majority, constipation appeared in childhood or at the age of puberty and in all cases became progressively intensified so that it was necessary to give purgatives, but even these proved inefficacious. The constipation was accompanied by the syndrome of membranous peri-enteritis. Obstinate constipation was interrupted at times by attacks of diarrhœa associated with abdominal pains and a feeling of obstruction, generally in the lower right quadrant.

Physical examination revealed an area of tenderness of varying intensity. In all the patients the digestive function was affected in varying degrees in each, producing a marked reaction on the general condition, which was variable in its clinical manifestations.

The diagnosis arrived at was perienteritis, and this diagnosis was founded on the history, the physical and X-ray examinations. In this group the regions most constantly affected were the cæcal and ascending colonic regions. This form of cæcocolonic perienteritis as recorded in the six patients was associated, in every case except Case 1, with other foci of membranous perienteritis, as follows:

Case 2, ileocæcocolonic perienteritis with symptoms of Lane's kink; Case 3, perienteritis of the splenocolic angle, affecting the left half of the transverse colon and the first portion of the descending colon; Case 4, perienteritis of the descending colon; Case 5, perivisceritis of the upper right quadrant, affecting the gastrohepatic duodenal region;

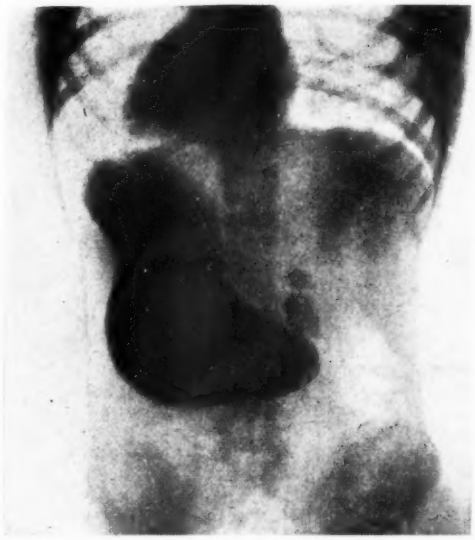
Roentgenogram 3. Case 2, taken 24 hours after bismuth meal, showing the cæcum and ascending colon distended with retained bismuth.



Roentgenogram 5. Case 3, taken 6 hours after bismuth meal. The cæcum and descending colon are greatly dilated, atonic, flattened, with bismuth shadows irregularly distributed. The first portion of the transverse colon evacuated normally. The second portion has a blurred outline and bismuth shadows irregularly distributed.

Roentgenogram 4. Case 3, taken immediately after bismuth meal, showing the stomach slightly ptotic and hypotonic. The pyloric cavity, duodenum and first portion of the jejunum are filled with bismuth.

Roentgenogram 6. Case 3, 24 hours after bismuth meal, showing cæcum considerably distended. The outlines of the ascending colon are blurred. Aereocoly with irregular bismuth shadows at the level of the hepatocolonic angle.



Roentgenogram 7. Case 4, immediately after bismuth meal. The stomach is large and smooth, slightly ptotic and hypotonic.

Roentgenogram 8. Case 4, one-half hour after swallowing the bismuth. The stomach is partly empty and shows a few peristaltic waves. The duodenal bulb is full. There is bismuth in the jejunum and first portion of the ileum.

Case 6, existent perienteritis of the descending colon, together with an intense chronic catarrh of the rectosigmoid.

The roentgen examination furnished in all the patients findings of fundamental value in regard to the form and function of the large intestine, and by this means alone perienteritis may be diagnosed.

These patients without exception had had medical treatment for a long time; usually for years, without effect. Different forms of treatment had been prescribed, always symptomatic and without fundamental effect, because late hereditary syphilis was not suspected.

The patients presented a variety of organic alterations. Dysendocrinisiasis was present in every case, with hypothyroidism predominating, and frequently associated with hypo adrenalism or dysovarism. Aortitis alone or associated with mitro-aortitis was a frequent finding in our series and by the way (for we shall come back to the subject), at no time did we attribute this condition to chronic constipation, but we did consider it one of the diverse manifestations of hereditary syphilis the symptoms of which were presented by all the patients in a more or less typical form.

Gastric and intestinal vagatonia was a frequent condition, and we consider the nervous disturbances as secondary to hypothyroidism or hypo-adrenalism.

In all the patients in the first group, the presence of hereditary syphilis was evident. They presented characteristic dystrophic stigmata associated with active tertiary infection. Their improvement under specific treatment has convinced us that we were quite right in our assumption. The family history was of the greatest value in confirming our diagnosis.

In all these patients, the specific treatment in general and the mercurial treatment in particular yielded very favorable results. For the most part we used Van Swieten's solution in progressive doses, by mouth. In no way can the efficacy of the specific treatment be attributed to the "irritant" effect of the mercurial salts taken by mouth, for its

Roentgenogram 9. Case 4, 6 hours after bismuth meal. In the interval the patient has voided the bowels. There still remains a small quantity of bismuth in the end portion of the ileum. The outlines of the cæcocolon are flattened. The first portion of the descending colon shows retention of bismuth.

Roentgenogram 10. Case 4, 24 hours after bismuth meal. At the level of the cæcum there is great retention of bismuth, with persistent flattening of the cæcal outlines. The bismuth shadows are irregularly distributed at the level of the ascending colon (right angle and first portion of the transverse). Marked aereocoly at the level of the hepatocolonic angle.

efficacy was greater when administered, per rectum, by injections of gray oil and enesol.

The efficacy of mercurial preparations in chronic abdominal conditions has already been demonstrated by Lane (6), who expressed himself in the following terms when dealing with the rôle ascribed to the liver in producing the conditions brought about by defective mechanism of the intestine: "And drugs are given with the object of acting on the liver which stimulates its function, or possesses antiseptic properties. I need only refer to mercury as an excellent example of this kind."

And further on, he adds: "This would explain the benefit which so often follows in cases of inflammation of the gall-bladder by stimulating the passage of material through the intestines by drugs, such as olive oil, calomel, etc." We believe it only too probable that the cases referred to by Lane which improved through mercurial preparations were similar to the group we have studied and that even though the author makes not the slightest allusion to the possibility of late hereditary syphilis, we believe that this infection was present.

SURGICAL GROUP

Case 1. J. C., age 28, Argentinian, mechanic, November 18, 1914. The patient entered Ward XIV, Ramos Mejia Hospital. He was suffering with chronic gastro-intestinal disturbances of an insidious, diffuse nature. The personal history is good. The patient has been rather constipated. While under observation the stomach disturbances were aggravated and the patient complained of pyrosis and distention after meals, anorexia, moderate intermittent intestinal tympanites and asthenia. The X-ray revealed a stomach of atonic type. Operation was performed in the belief that the patient had a duodenal ulcer, but the diagnosis was not confirmed. We did find, however, membranous periduodenitis, such as Morris has described. We did a posterior gastro-enterostomy occluding the

pylorus by folding in three planes with silk. The patient made a good recovery from the operation but derived but little benefit from it, for he experienced only slight relief from the gastroduodenal symptoms. Weight 66 kilograms, height 1.81 meters; when well, weight 85 kilograms. Postoperative roentgenological examination showed a small spastic stomach. The gastro-enterostomy opening was well to the right of the middle line; the pylorus did not function.

Seven months later the patient came back complaining of pain in the lower abdomen, a sense of fullness after meals in the hypogastric region, constant painful sensitiveness, chiefly in the right iliac fossa cæcum, and descending colon. Constipation was more marked than before operation. Radioscopic examination revealed the stomach in good position. Peristaltic movements were almost normal and there was rapid evacuation through the gastro-enterostomy openings. The pylorus did not act. In regard to the rest of the intestinal tract there was ileal and cæcal stasis 12 hours after the bismuth meal, and the haustral markings on the ascending colon were absent. The patient declares that his stomach "feels better," but he is asthenic and worried because of the intestinal troubles which lessen his fitness for work. Exploratory laparotomy revealed

Roentgenogram 11. Case 5, showing perityphilitis and pericolitis with spastic tendency of transverse colon.

Roentgenogram 12. Case 6. Repletion of colon by bismuth enema. Cæcum and ascending colon greatly dilated and with flattened outlines, ileocæcal valve freed; ileum occupied at end portion. Lengthening of descending colon with flattening of its outlines.

Roentgenogram 13. Case 6, several minutes after administration of bismuth. Phenomena similar to those seen in previous photograph, but with a marked reduction in the bismuth content of the cæcum and ascending colon.

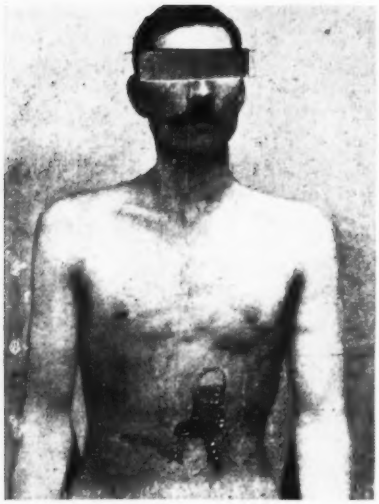


Fig. 1. Face, upper and lower limbs with acromegalic tendency, absence of color. Thoracopelvic conformation of eunuchoid type.

slack adhesions of the omentum to first scar. Neostoma, transverse mesocolon, and a meter of the jejunum were attached by new, lax, avascular adhesions. A typical Lane's kink (Fig. 3) is present, and as well insufficiency of the ileocæcal valve. There are membranes on the cæcum and a fatty pericolonic infiltration in the ascending colon. After mobilizing the cæcum, typhlosigmoidostomy was done.

For the first fortnight after the operation, the patient suffered from diarrhœa, after which the bowels became normal. Later, another operation was necessary on account of eventration of the wound. The patient made a good recovery.

Four years later he came back to the ward, complaining again of asthenic symptoms, slight headaches and loss of weight. He suffered from mild constipation and gastro-intestinal disturbances as before, although not so marked. We examined the patient along other lines and from the family history and the physical findings were lead to seek another explanation of the cause of his illness. We found that the father died of aneurism. The patient was abnormal in development. He had a long, drawn-out thorax, wasp waist, and wide hips. He was of the eunuchoid type with upper and lower limbs out of proportion (Fig. 1), collar bones protruding, tibiæ rough, palate arched, face large, and the hands and feet were out of proportion. In other words, he was an acromegalic, probably due to alterations in the secretions of the hypophysis and testiculo-interstitial gland. Besides the above abnormalities he had chocolate-colored spots on the skin, achromic cicatrices, acrocyanosis, unequal pupils, slight pigmentation of the retina (non-typical), and enlarged spleen.

The administration of ten injections of gray oil of 0.10 centigram each, and iodine to 60 drops, produced an increase in weight of 2 kilograms, 500 grams; the digestive functions became quite normal, and the constipation and asthenia vanished. He is able to return to work and asked to be discharged so that he can return to his local physician for treatment.

Case 2. P. C., Argentinian, age 30. Pinero Hospital, History No. LXVIII, September 13, 1918. The family history was very vaguely given. The patient has always been healthy, except for constipation. He has had a good appetite. Two years ago, in 1916, he was operated upon in San Roque Hospital (Dr. Del Valle) for a duodenopyloric ulcer which had caused hæmorrhages. Five months later, he returned in good general and local condition, but he complained of slight distress throughout the abdomen, with pyrosis, rather difficult digestion, and gaseous distention. A course of gray-oil treatment (0.10 grams) and iodide was given and after the fourth injection all the distress vanished. Ten injections were given; at the end of the course the patient had gained 10 kilograms in weight. Two years later the patient returned to the Pinero Hospital complaining of a severe pain which commenced at the right flexure of the colon and spread downward to the cæcum. This pain had been present for the last 2 or 3 months. It had no relation to the meals. The patient is free from distress in so far as the stomach is concerned. The operation scar is normal in appearance. As for objective signs the only one to be found is painfulness on palpation over the cæcum, ascending colon, and left portion of the ileum.

Radioscopical examination by Dr. Donovan showed pericolitis, Jackson's membrane extending to back of the ascending and transverse colon, and adhesions in sigmoid. The gastro-enterostomy opening worked well and the pylorus did not functionate. The adhesions were freed without difficulty, it being supposed that they were not the cause of the disturbances. Up to November 24, 1918, the patient had been given a course of gray oil (10 injections of 0.10 centigram each); and had gained in weight from 67 kilograms, 800 grams to 74 kilograms. The abdomen was normal, bowels regular and the patient had no pains.

On March 28, 1919, he came back and asked for a new course of gray-oil treatment as the last course made him feel stronger, he had a better appetite, his color was better, and he felt more inclined to work. Stigmata and lesions attributable to hereditary infection were arched palate; long, rough arched bones; exostosis without history of trauma in the right tibia; chocolate-colored anectodermic spots on chest and back; unequal pupils, exaggerated reflexes.

The first gastro-enterostomy improved the gastric distress for a few months; it was finally cured by

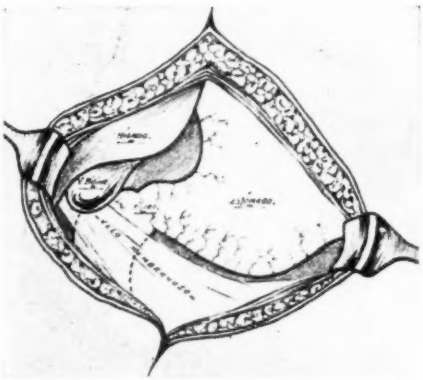


Fig. 2. Schematic drawing showing velomembranous periduodenitis (Morris type).

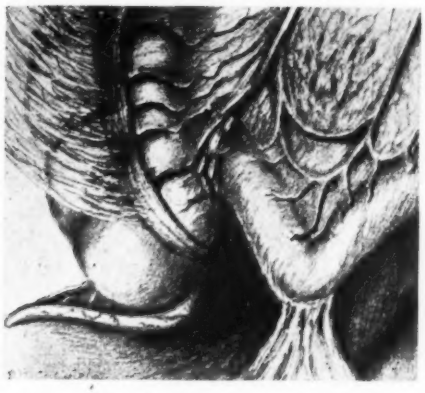


Fig. 3. Drawing showing ileocæcocolonic portion (Lane's kink) and external appendix (Jackson's membrane).

treatment with mercury and iodine. Two years later, symptoms appeared in the lower abdomen. There was revealed by a second operation adhesive epiploitis and retractile mesenteritis which did not fundamentally alter the intestinal physiology. But treatment with mercury and iodine repeated in several series accentuated the initial improvement not only in so far as the local symptoms were concerned, but also as to the nutrition and general health.

CASE 3. L. V., age 20, Portuguese, single. Pinero Hospital, History No. XVII. The father was operated upon for ulcer of the stomach. Of 5 brothers and sisters, 2 died in infancy. The mother had one miscarriage. The patient was operated upon for acute appendicitis, in Lisbon, when he was 10. He made a good recovery, had a good appetite afterward, and the bowels were regular. He denied venereal infection and there was no sign of it. For the last 8 months, he has suffered from alternate diarrhœa and constipation, tympanites in the right iliac fossa, and a distressing sensation of distention which was relieved by pressing with the hand causing an elimination of a great deal of gas. He further complains of general debility and weakness. The distress appears 3 hours after meals. On palpation a painful cæcum, pasty and mobile with painful gurglings on change of position, is noted. The cicatrix from operation is normal. The transverse, descending, and sigmoid colon painful and spastic to touch.

Radiological examination by Dr. Donovan shows membranes to the back of the ascending colon with ptosis and spasticity in middle portion; iliac long and with loop painful on pressure. Stigmata and lesions attributable to hereditary infection; collar bones and ulnæ arched and rough; arched palate; irregular teeth with erosions on sides and edges; receding forehead; second aortic tone vibrant; spleen enlarged. Unequal pupils and exaggerated reflexes were present.

When treatment with gray oil, 0.10 centigram each injection, was begun the patient weighed 54 kilograms. On October 14, 1918, after a series of 10 injections he weighed 58 kilograms; he had improved in appearance generally, had a rosy color, and weakness had vanished. Intestinal disturbances were quite regulated. Radioscopical examination showed normal peristalsis. Twenty-four hours after administration of bismuth, there were no residue in the rectum (Dr. Donovan).

Notwithstanding the improvement, an exploratory operation was proposed to the patient, and he agreed. No membranes on the ascending colon were found, although the radiologist had diagnosed them. There were only light adhesions to the great omentum, which pulled the ascending colon and the operative cicatrix but little. The adhesions were easily detached. In the ileopelvic colon mesenteritis was found on the lower surface which would explain the pain detected by the radiologist. On the whole, nothing was found which should disturb the intestinal function. The rectum and abdomen were normal. After operation slight intestinal disorders recurred but yielded to a new series of gray oil and iodine.

CASE 4. B. S., age 30, Argentinian. Pinero Hospital, January 7, 1919. History No. CXLIV. The father died at the age of 50. He suffered from mental disorders which were not defined. He had a sister who was subject to epileptic attacks. The patient enjoyed good health until 20, although constipated. At the age of 20, that is 10 years ago, the patient began to suffer from pyrosis, abdominal distention, difficult digestion, with frequent headaches and sometimes vomiting. He was very constipated, the bowels not moving for 3 or 4 days. Two fingers below the xiphoid in the median line, there is a spot of extreme tenderness. The patient described the pain at this point as of spontaneous erosive nature, unrelated to meals. He has had periods of partial com-

Fig. 4. Semischematic drawing showing chronic appendicitis, pericolonic membranes of "valvular" type.

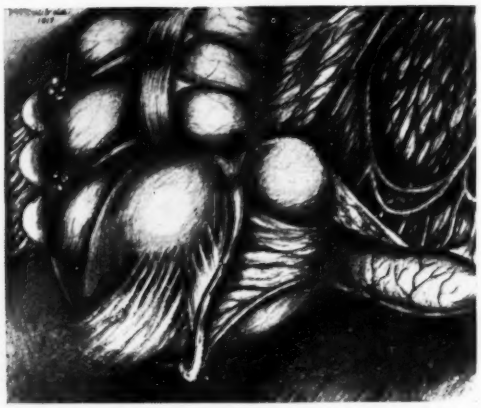


Fig. 5. Retrocæcal ascending chronic appendicitis. Peri-appendicitis. Pericæcocolonic membranes of "valvular" type.

fort and attacks of acute pain radiating toward the back and loins. During the attacks he has vomited but he has never seen blood in the vomitus.

Radiological examination by Dr. Donovan showed that there was no retention in the stomach, which was of the hypotonic type. There was an exquisitely painful spot at the small curvature with a spastic note at that level. Peristalsis was normal.

Diagnosis: ulcer at the small curvature (?). Stigmata and lesions attributable to hereditary infection: small ill-proportioned skeleton; lower limbs too small, bones rough, crests of tibiæ arched; teeth were irregular and were prematurely eroded and carious; irregular pupils, exaggerated reflexes, anæmic color; skin of the face prematurely wrinkled; general nutrition, poor.

At operation not even a trace of ulcerous lesion of the stomach was found. There was present chronic perienteritis, however, which manifested itself in the shape of milky patches, large and thick, scattered over the surfaces of the stomach and liver. The stomach had a thin atrophic wall, the veins were quite prominent, giving a dark tinged appearance. The rest of the abdomen was normal. Appendicectomy was performed and the appendix found to be normal. The patient had attacks of severe paralytic ileus which were finally overcome.

For the next treatment with novoarzenobenzol, 0.30 centigram was given. After three injections there was a total disappearance of the gastric symptoms, the bowels were completely regulated, the patient gained 3 kilograms in weight, the color of the skin became rosy, and the headaches disappeared. Four months later the patient continued to improve and treatment was resumed. Six months later the second series of novoarzenobenzol (7 injections) was completed.

Case 5. X. X., age 24, Argentinian, single. The father died at the age of 45 from a cardio-aortic affection (syncope); the mother at the age of 45, of aortitis, dilatation, marked systolic murmur, and attacks of angina of medium intensity, all of which improved with mercury and iodine treatment. An aunt who was mentally deficient died after having first lost part of the nose and cartilaginous bridge from a severe ulceration which was healed by treatment with mercury. The patient has 3 sisters who have gross dystrophy of the bones and teeth.

For the past 2 years, the patient has been the subject of watery, bilious vomiting in the morning which lasts for some hours. This is accompanied by vertigo, and headaches and is preceded by nausea and sensitiveness over the whole abdomen, especially on the right side. She has periods of relief. The abdomen is ptotic. The cæcum is large, mobile, and tender. MacBurney and Lanz spots were present, the color is anæmic, the patient has lost in weight. There were mild, intermittent attacks of constipation. Stigmata attributable to hereditary infection were a left-sided asymmetry of the face, malformation of the bridge and wings of the nose; arched palate; and teeth with numerous erosions; mild dorsal xiphoscoliosis, prominent clavicle, sunken chest, exaggeration of the normal angle at the elbow and knee. The patient married and had an abortion of twins at 3 months (monstrous pregnancy).

The operative and clinical diagnosis was chronic appendicitis. The cæcum had thin, atonic walls, and on its outer border were membranous peculiar formations, in shape and appearance resembling the heart valves. These formations had crescent-shaped, central portions of a nacerous color, of fibrous consistency, giving out through their convexity and concavity, fibrous extensions like the ventricular columns of the heart which insert themselves laterally into the peritoneum of the colic gutter and in the outer border of the cæcum (Fig. 4).

CASE 6. X. X., age 17, Argentinian, military cadet. The father acquired syphilis with premature arteriosclerosis and attacks of angina at 45. The patient has several brothers and sisters, all with pronounced dental defects. The personal history is good. He denies venereal infection and shows no signs of it. He is not constipated. A month before being examined the patient had an intermittent, stitch-like pain. These pains occurred always during defæcation, were in the cæco-appendicular region and radiated toward the thigh. MacBurney's and Lanz's spots were exquisitely painful and tender. Except for dental and nasopharyngeal stigmata of the nasal adenoid type, the patient was robust.

Operation disclosed a chronic appendicitis with typical inflammatory lesions of the wall. The meso-appendix was adherent to the lower edge of the mesocæcum with adhesions stretching like the wanes of a quill to the cæcum and ascending colon (Fig. 5). As a cæcal lesion, we find the valve-like adhesions similar to those in Case No. 5 which we consider a valuable sign of hereditary syphilis. The patient recovered well from the operation. No other treatment was given.

This group of patients whose progress was studied under the rigid control of laparotomy, range between the ages of 20 and 30 years. The younger ones gave histories of 1, 2, and 3 years' duration; the older ones of rather longer periods (6 to 8 or 10 years, Case 4), showing that the disorders appear usually in young persons before attaining full growth. This is similar to what was shown in the first group. In all of them, too, constipation occurred as a premonitory symptom of approaching gastro-intestinal disorders. The latter manifest themselves by statical mechanical alterations and changes in secretion, in some cases affecting the intestinal tract in many ways (Cases 1 and 2), from the stomach to the iliac colon; in others, it is found to be limited to the stomach and the liver as in Case 4; in still others, to a lower tract, such as the cæcum, the descending colon, and appendix.

Acute or chronic lesions of the appendix which at first were independent of other disorders are shown in Cases, 3, 5, and 6. The existence of appendicitis strengthens the presumption of a pathogenesis connected with congenital malformations of the organ. Case 2 showed the concurrence of duodenal ulcer, a phenomenon explained by Lane as a result of the enterocolonic lesion.

The predominant abdominal symptoms are not very different, save that they vary slightly from the classical "chronic abdomen," velomembranous perienteritis, and other conditions similarly named; on the other hand, the symptoms are almost identical with those described in the previous group, i.e.: laborious digestion, pyrosis, tympanites, subjective and objective phenomena of spasticity combined or alternating with atonia or ptosis; tenderness as in Case 1, to real pain in the epigastrium as in Case 4, and in the right iliac fossa as in Case 3; permanent constipation of the atonic type in some, as in Case 4; or partial and intermittent, alternating with diarrhœa in others, Case 3; of a spastic type, in others still.

The operation performed for therapeutical reasons in some, and for exploratory reasons in others, has shown interesting pathological data. Thus in Case 1 for instance, we discovered the extent of the peritoneal process, which began at the duodenum (Morris) and ended at the iliac colon with its ileal bend (Lane's kink), its ascending pericolonic membrane (Jackson's), and all lesions in an advanced stage, and which clearly obstructed regular peristalsis. However, in Cases 2, 3, and 4, exploration of the abdomen revealed only small membranes, ordinary adhesions, slight retraction of the mesentery, of little mechanical significance. These could in no way be responsible for the functional disturbances noted. These findings show that identical or similar clinical symptoms may be found in these sufferers, with fundamental differences, in their pathology—an important fact to remember.

Generally speaking, in all and particularly in the sufferers from loss of weight and strength, lax mesentery and consequently ptotic and mobile organs were found (Cases 1, 2, 3, and 4). At the same time, the walls were thin and transparent and there was plainly visible in the submucous membrane, a venous network, the veins being enlarged and distended. This condition gave the organ the color of red wine.

In Cases 5 and 6, we find peri-appendicular and pericæcal lesions of a peculiar nature undescribed hitherto by any observer, to which we attribute an etiological significance, so evident that we do not hesitate in assigning

it to hereditary syphilis, located in the peritoneum (Del Valle). This type of membrane is shown clearly in the semischematic sketches (Figs. 4 and 5). It was not the usual feathery character nor the redish flesh color or translucency described by Lane and Jackson. It has a characteristic shape, is trim, and resembles the fibrous valves of the auriculoventricular valves of the heart. Thus, white nacreous zones in more or less regular halfmoon or crescent shape are to be seen. These are inserted into the outer side of the cæcum in their concavity, while on their convexity they are fixed by a somewhat wider area to the gutter of the colon, pulling and fixing the cæcum to an outer and higher part of the iliac fossa. This is quite the opposite of the anomaly described by Wilms, as "movable cæcum." This anatomical condition and none other was found in two patients (Cases 5 and 6) with well marked hereditary syphilis, who were operated upon for chronic appendicitis. On account of the strange likeness to the valves and columnæ of the heart, we usually call the condition "valvular perityphilitis."

Their form, appearance, and composition reveal a remote origin, undoubtedly dating back to intra-uterine life. They must be considered as congenital deformities. In Cases 1, 2, 3, and 4, combined with the complex abdominal symptoms, manifold dysendocrine symptoms were revealed, characterized by slight signs of insufficiency of hypophysis, thyroid, parathyroid, ovary, testicle, and almost constantly in all cases, the suprarenal gland (asthenic patients). In Cases 5 and 6 which showed symptoms attributable to the appendix alone, no endocrine disorders of any importance were found. By contrast this peculiarity establishes the fact that a pathogenic bond links all these chronic gastrointestinal and endocrine disturbances. In Cases 1, 2, 3, and 4, which had many or few membranous products, the disorders of the digestive tract exist clearly in addition to the dysendocrinisiasis. On the other hand, in Cases 5 and 6, with intestinal adhesions, it is certain that there were no active endocrine disturbances. Concurrently with the endocrine alterations cited, in every case were found dystrophic stigmata of the bones, teeth, skin, positive proof of glandular infection or intoxication in the intra-uterine stage and period of infancy. Besides, these organic lesions of a later period of the aorta, liver, spleen, pupils, etc., show in short the whole common origin of all these anomalies the connection of which with hereditary syphilis can today no longer be disputed.

Be it noted that in Cases 1 and 2 the antisyphilitic treatment was prescribed only after 3 or 4 years when all surgical means had failed. During this period in studying our patients we had not sufficient criteria at hand to permit our determining a definite etiology. And be it noted likewise that in the two cases alluded to the surgical research could not have been more thorough as regards the kind of pathology which we were endeavoring to correct. In Cases 3 and 4, the surgical treatment was undertaken for exploratory measures and after having obtained a good result with the medical treatment (mercury, iodide, and arsenic) could add nothing much to the initial success.

In Cases 5 and 6, the only treatment essayed was appendicectomy as the local manifestations indicated. Nevertheless since starting with this paper we have incidentally heard from Case 5 who was operated upon 5 years ago. The woman was predisposed to chloroanæmia. She married and miscarried after a 3 months' pregnancy with twins, followed by severe hæmorrhage. In reviewing the history the paternal and collateral antecedents will become evident.

SURGICAL TREATMENT

Surgical treatment cannot be considered without a thorough knowledge of the clinical problem presented by each particular patient, that is, until after a thorough and well-thought-out clinical study of the patient. Proceeding thus, we shall divide these patients into two great groups, which are useful from a practical point of view and are of therapeutic significance: (1) anatomical group; (2) functional group.

Anatomical group. This group will consist of those patients in whom diagnosis has establisted the existence of multiple adhesions (Morris, Jackson), or mesenteric retractions

which bend and obstruct mechanically the digestive tract. It will likewise comprise those who show signs of chronic inflammatory processes, concurrent or subsequent to the abdominal affection, as appendicitis, cholecystitis, duodenogastric ulcer, adnexitis, etc. This type will clearly benefit by the different surgical measures. In order not to exceed the limits of this article, we shall only say that these measures consist in serving the membranes with the corresponding peritoneal repair, the details of which will be discussed in a future paper. In concurrent inflammatory lesions, further surgery as indicated by the condition will be performed. The prognosis will be good but certain reservations must always be made.

Functional group. This group consists of those in whom it has not been possible to diagnose peri-entral lesions in a stage and of a nature resembling those in the first group. This second group must be considered from a different viewpoint, for some patients manifest only variable symptoms. These may well be called "entero-atavic," meaning thereby that the static changes together with changes in the digestive secretions vary as if they had lost their regulating forces through some lesion of the sympathetic or sympathicocapsular nerve (chronic sympathicopathy). These patients should not be operated upon and will be more benefited than the first group by medical treatment; consequently, their prognosis will be much better than that of the first group. Between the two may be found every intermediate stage, and by a little practice each stage can be properly classified. On the other hand, this conventional classification does not exclude in any sense, the sufferers of the first group from a concurrent sympathetic functional lesion or a sympathicocapsular one. On the contrary, we are of the opinion that such a possibility is never lacking in this affection.

In conclusion we may add that no surgical treatment should be given until the result of the medical treatment is known. The medical treatment prescribed in this group of patients was always on a mercury basis and consisted in injections of gray oil in doses of 0.08 to 0.10 centigram each, given in a series of 10, and repeated after a 30-day interval. We systematically combined iodine in the form of iodide and tincture in large doses, according to how it was tolerated.

In all we had a favorable response after the second, third, and fourth injections; digestion began to improve, the patient took nourishment and consequently there was an increase in weight, recovery of strength, and better color of the skin and the mucous membranes.

In Case 3, we used exclusively intravenous novoarzenobenzol in progressive doses and obtained surprising results. After the third injection, the gastric pains and obstinate constipation which had been present for 10 years vanished. At the present time after a second series, the patient remains cured.

With regard to the etiology of the perienteritis in our patients, we had no preconceived ideas (for 50 per cent of them were subjected fruitlessly to modern surgical treatment), and it has been shown by the success of the treatment that hereditary syphilis was present in nearly all of our cases in various forms and late in its manifestations.

As to pathogenesis, we believe that it is not a question of a single mechanism, but at the least complex and varying as the persons in question have gross anatomical lesions or have no important lesions. In the latter, we believe that we are dealing with real chronic sympathicopathies mainly or exclusively of endocrine origin.

In those subjects with anatomical lesions, we must take into consideration congenital malformations, true failures in development caused by hereditary syphilis through the endocrine glands which play a primordial part in the fœtal development, first, and in the extra-uterine life, later on, presiding over, directing, and regulating fœtal development and growth in the very important and complex morpho-regulating function.

The faulty conformation of the abdomen on the one hand and the lack of endocrine balance on the other (chiefly thyroid and capsular, and occasionally hypophyseal) engender disturbances in the digestive statics and dynamics which end in a chronic inflammatory condition of the colon. Constipation intensifies the colitis which it has brought on, and the latter

extends the inflammatory process and intensifies the congenital lesions, thus constituting a vicious circle not easily broken.

The foregoing considerations substantiate the following conclusions:

CONCLUSIONS

1. Hereditary syphilis is a very frequent cause—perhaps the most frequent—of membranous perienteritis and analogous conditions.

2. Its pathogenesis is complex as several factors operate, which set down in chronological order are: defects of conformation in the intestinal walls because of the faulty endocrine function which presides over and governs their development. These malformations on the one hand, and the abnormal function of the nervous system (sympathetic and autonomous), owing to the endocrine deficiencies, produce defects in the gastro-intestinal statics and dynamics. As a consequence of the latter we have intestinal stasis which brings on chronic inflammation of the colon. From the wall of the colon the inflammation spreads to the surrounding serous membrane, aggravating the existing congenital lesions. The primary cause of all this is hereditary syphilitic infection, generally in the form of a late manifestation.

3. These cases, first of all, should be given mixed antisyphilitic treatment with mercury chiefly.

4. The surgical treatment is not to be abandoned, but is to be restricted to cases in which definite indications confirmed by clinical and radiological diagnoses point to mechanical alterations of importance (kinks, adhesions, etc.); or to co-existing inflammatory lesions of adjacent organs: ovaries, tubes, appendix, gall-bladder, duodenum and stomach. Surgical treatment should consist in separating membranes and in molding and mobilizing the peritoneum, together with careful peritonization and removal of the adjacent affected organs.

5. There is the group in which the patient suffers from the chronic abdomen and yet there is no anatomical lesion of importance. These should be considered as types of "sympathicopathy," owing to the particular deficiencies, more or less marked, of the endocrine glands as suprarenal capsules and thyroids, principally. It is important to know this type of chronic abdomen, for it involves a prognosis and a therapeutic management very different from the membranous perienteritic type.

6. The prognosis depends on the anatomical and clinical type, and the period or stage of the affection: good, in cases of early diagnosis and rational treatment; less favorable, in those of late diagnosis where rational treatment is impotent in modifying chronic lesions already well developed. In these a more or less pronounced improvement is to be obtained by carring out suitable surgical treatment.

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OBSERVATIONS ON THE TECHNIQUE AND INDICATIONS OF RADIUM-THERAPY IN UTERINE CARCINOMA[1]

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IN reviewing the literature on the treatment of uterine carcinoma with the γ-rays of radium, we are at once confronted with the fact that a uniform plan of the application of the rays does not exist. It appears that every radiologist has a technique of his own. The greater number of clinicians use radium salts, a lesser number use emanations. A difference in the therapeutic action and results obtained by either preparation does not exist as milligrams of element correspond in radioactivity to the same number of millicuries of emanation. Some clinicians advocate the application of large amounts of radioactive substances; others deem a small amount sufficient; some prefer the use of large or small amounts within short or long time intervals; others advocate one continuous exposure. Again, if intermittent applications are made, some advise a short exposure, usually 10 to 12 hours, others would extend it to 24 hours, and so forth.

We have given the various methods an extensive trial in our clinic during the last 6 years. Careful records have been kept of all the cases and have enabled us to evolve a method which we deem safe and efficient. Another question seems as yet to be unsettled; namely, whether the pelvic organs should be removed surgically after a local healing of the cancer growth by the rays, or whether such a procedure would be superfluous.

The technique of radiumtherapy must be based on the diseased conditions found in the pelvis in uterine carcinoma. The purpose of the treatment is to destroy the cancer completely without producing serious injury to the surrounding healthy tissues and organs which would render illusory the first object.

The vaginal portion of the cervix lies in the interspinal line, the cervix and lower part of the uterus and parametria lie somewhat higher. A plane through the anteroposterior diameter of the mid-pelvis well defines the limit of the disease upward. Cervical carcinoma spreads by invasion of the vaginal vault, by infiltration of the lymph vessels of the parametria, by extension into the paravaginal tissues and along the sacro-uterine ligaments to the pararectal tissues and rectum, and through the vesicovaginal septum to the bladder. The part of the pelvis between the pelvic outlet and the mid-pelvic plane contains all these structures and is the space which must be rayed. The transverse and anteroposterior diameters of the mid-pelvic plane are 12 centimeters long, the transverse diameter of the pelvic outlet is 12 centimeters, and the anteroposterior diameter is 11.5 centimeters long. The cervical canal lies in the pelvic axis. Hence *a radium capsule placed within the cervical canal will disperse the rays evenly through the pelvic cavity. The rays must penetrate 6 centimeters of tissue all around with such an intensity at the periphery that carcinoma cells at this distance become destroyed.*

We also must endeavor not to injure permanently the vital organs and structures located in this area—they are the rectum, the bladder and the ureters. The posterior wall of the bladder, the anterior wall of the rectum and the ureters are 1.5 centimeters distant from the cervical canal if the organs are empty. Should the bladder and the rectum be filled they are forced closer to the cervix and the distance is reduced to about one-half. Therefore, it is necessary that the bladder and the rectum be empty and left empty during the treatment. This will be understood when discussing dosage. *We insist on the insertion of a retention catheter in the bladder and the flushing of the bowels with castor oil and enemata immediately before beginning the treatment.*

The amount of radium to be used depends on the extent or impulse of the radioactivity of the radium preparation and the extent of the area to be rayed. We must use the smallest amount permissible. Overdosing leads to dangerous complications, as necrosis and destruction, infection, painful cicatricial tissue formation causing stricture of the rectum, vagina, and ureters. The systemic reaction, also, places a limit on the amount of radium it is advisable to use. Rapid disintegration of diseased and normal cells leads to absorption and at times severe toxæmia that may prove fatal.

The object of the application of radium is to apply the element for a sufficiently long time to destroy the deeply located pathological processes within the pelvis without permanent injury to the healthy tissues and organs. This dosage can be determined only by the biologic measurements of each radium preparation. Dosage is a complex quantity and comprises the quantity of radium in

[1] Read before the Chicago Gynecological Society, March 19, 1920. (For discussion, see p. 201.)

milligrams of element, the length, width, and depth of the container, the purity of the salt, the filtration such as rubber and metal filters, the distance of the radium from the area treated, the time duration of the exposure, and the time intervals between exposures. The tubes used in our clinic contain each 25 milligrams of the element in the form of the insoluble sulphate of a chemical purity better than 94 per cent. The salt is packed in a glass cylinder of an outer diameter of 2 millimeters and a length of 6 millimeters. The glass cylinder is inserted in a silver capsule of a wall thickness of 0.5 millimeters and a length of 1.75 centimeters. We place two such capsules in a brass filter of a wall thickness of 0.7 millimeters. The metal filter, therefore, is 1.2 millimeters and effectually absorbs the beta radiation. The Sagnac rays formed in the metal filter are absorbed by a pure, black rubber tubing of a wall thickness of 3 millimeters in which the radium carrier is inserted. If such a container is placed over healthy skin at a distance of 1 centimeter between the axis of the radium capsule and the skin surface, then a reddening of the skin is observed within 10 to 14 days after an exposure of somewhat less than 2 hours. This dosage is termed an erythema skin dose and amounts to about two times 50 milligrams, i. e., 100 milligram element hours (mg. e. hrs.). If the exposure is increased to two and one-half to three hours a blistering appears after 10 to 14 days. A burn of the second degree has been caused. Should the exposure be extended to 20 hours a burn of the third degree results—the epithelium has been totally destroyed. The erythema and the second degree burn heal very rapidly without leaving a permanent defect. Should the radium carrier be applied at a distance of 2 centimeters then a erythema dose is obtained within 8 hours, and a blister dose within 12 hours because the intensity of the rays decreases inversely with the distance.

The sensibility of carcinoma tissue to rays is held to be about one-half greater than that of normal tissue. This does not agree with the findings of Kroenig and Friedrich. They found that an erythema skin dose is obtained by an application of rays measuring 170 electrostatic units (e) determined with a Wolf electrometer. They consider this the lethal skin dose. The dose that causes, after a certain time interval—usually 14 to 20 days—a visible and palpable decrease of the carcinoma growth is termed a carcinoma dose and is 150 e. The cancer sensibility quotient is obtained by dividing the skin dose with the cancer dose, i.e., $170 \div 150 = 1.15$. By biological tests we found that the erythema skin dose is about 100 mg. e. hrs. Hence the cancer dose must be $170 : 150 = 100 : X$ and $X = \frac{150 \times 100}{170} = 88\frac{4}{17}$ mg. e. hrs., or in round numbers 90. It has been impossible to install an electrometer to verify the measurements of Kroenig and Friedrich. I do not see any objections to them, as the experiments have been very scientific, thorough, and accurate. Applying the law of the inverse ratio to these results, we find that the lethal erythema skin doses are 100, 400, 900, 1600, 2500 and 3600 mg. e. hrs. for distances

TABLE I.—CLASSIFICATION OF UTERINE CARCINOMATA

GROUP I. Carcinomata which are clearly operable after a physical examination.
- a. Cases treated with pre-operative radiation and panhysterectomy.
- b. Cases treated with panhysterectomy and postoperative radiation.
- c. Cases treated only with radiation.

GROUP II. Carcinomata which are doubtfully operable. "Borderline cases."
- a. Cases subjected to panhysterectomy and postoperative radiation.
- b. Cases treated only with radiation.

GROUP III. Carcinomata in which an operation is absolutely impossible after a physical examination.
- a. Cases treated with radiation and subsequent panhysterectomy.
- b. Cases treated with an extensive cauterization and radiation.
- c. Cases treated only with radiation.

GROUP IV. Carcinomata so far advanced that all treatment is hopeless. Such cases are subjected to radiation for purposes of palliation.
- a. Cases treated with cauterization and radiation.
- b. Cases treated only with radiation.

GROUP V. Carcinomata that recurred after a panhysterectomy.

TABLE II.—TOTAL NUMBER OF CASES IN EACH GROUP AND GROSS RESULTS

Group	Living	Dead	No Report or Refractory	Total
Ia	3			3
Ib	9	2		11
Ic	1			1
Total	13	2		15
IIa	5	5	3	13
IIb	7	2		9
Total	12	7	3	22
IIIa	2	10	4	16
IIIb	4	9	12	25
IIIc	18	11	12	41
Total	24	30	28	82
IVa	1	1	4	6
IVb	6	16	11	33
Total	7	17	15	39
V	9	16	25	50
SUMMARY				
Group I	13	2		15
Group II	12	7	3	22
Group III	24	30	28	82
Group IV	7	17	15	39
Group V	9	16	25	50
Grand Total	65	72	71	208

TABLE III.—TIME ELAPSED SINCE TREATMENT IN CASES KNOWN LIVING OR DEAD OF GROUP I

SUBGROUP A					SUBGROUP B					SUBGROUP C				
Living		Dead		No Report or Refractory	Living		Dead		No Report or Refractory	Living		Dead		No Report or Refractory
Yrs.	Mths.	Yrs.	Mths.		Yrs.	Mths.	Yrs.	Mths.		Yrs.	Mths.	Yrs.	Mths	
					5			3		2	7			
5	6				5			4						
4	11				4									
2	10				2	7								
					2	7								
					2									
					1	7								
					1	5								
					1	1								

I

TABLE IV.—TIME ELAPSED SINCE TREATMENT IN CASES KNOWN LIVING OR DEAD OF GROUP II

SUBGROUP A					SUBGROUP B					SUBGROUP C				
Living		Dead		No Report or Refractory	Living		Dead		No Report or Refractory	Living		Dead		No Report or Refractory
Yrs.	Mths.	Yrs.	Mths.		Yrs.	Mths.	Yrs.	Mths.		Yrs.	Mths.	Yrs.	Mths.	
	11		3	4	1	2	1	2	12	2	8		8	12
	9		2		3	3	1	8		1	8	2	10	
			5		4			2		1	4		8	
			5		2	6	1	6		1	4		2	
			5					3		1	4		8	
			7				2	1		1	2	1	4	
			1				1	9		1			9	
		1	1					6		1		1	3	
			9					10			11	1	3	
			7								10		10	
											9		2	
											9			
											8			
											6			
											6			
											6			
											4			
											4			
Total	2		10	4		4		9	12		18		11	12	82

of 1, 2, 3, 4, 5 and 6 centimeters respectively; while the corresponding cancer doses are 90, 360, 810, 1440, 2250 and 3240 mg. e. hrs.

If the radium carrier is placed in the cervical canal after a proper dilatation then the posterior wall of the bladder and the anterior wall of the rectum are forced 2 centimeters distant from the radium source. A ten hour application, or 500 mg. e. hrs., would not injure the bladder or the rectal walls to the extent of a second degree burn, as it takes 4 times 150 or 600 mg. e. hrs. to do so. However, it would visibly and palpably damage the cancer tissue within a radius of 2 centimeters, as the cancer dose would be 4 times 90 or about 360 mg. e. hrs. We may assume that the healthy cells of the bladder and the rectum will rapidly recover so they will bear another application without permanent harm

TABLE V.—TIME ELAPSED SINCE TREATMENT IN CASES KNOWN LIVING OR DEAD OF GROUP IV AND OF GROUP V

SUBGROUP A					SUBGROUP B					SUBGROUP C				
Living		Dead		No Report or Refractory	Living		Dead		No Report or Refractory	Living		Dead		No Report or Refractory
Yrs.	Mths.	Yrs.	Mths.		Yrs.	Mths.	Yrs.	Mths.		Yrs.	Mths.	Yrs.	Mths.	
2	9		1	4		10	4 days		11	3	9		8	25
						7		4		1	10	1		
						5		2		1	4		3	
						3		5			9	2	6	
						3		5			10		11	
												1	7	
						2		7			10		6	
								2			7		3	
								2			3	2	3	
								2			3		8	
													6	
							4 days						3	
								5				1		
							3 days						5	
							8 days					12 days		
								11					2	
							6 days							
							6 days							

after an interval of 12 to 14 hours, and so on until seven treatments of 500 mg. e. hrs. each have been applied on 7 consecutive days, i.e., a total amount of 3500 mg. e. hrs., the amount necessary to degenerate all carcinoma cells as far as the bony pelvic wall. As a matter of fact cystoscopic examinations made at 10 day intervals and extended over a period of 6 weeks have verified the correctness of the assumption. We have never observed a marked change in the bladder mucosa except an intense reddening. We have obtained postmortem examinations in 2 patients, who succumbed after a recession of the cancer tumor by radium-rays. As soon as we have completed the microscopic examinations of all the pelvic tissues, I will be able to know whether the amount of radium element in milligram hours actually did degenerate carcinoma cells adjacent to the bony pelvis.

The patient is subjected to careful re-examinations 10, 30, and then every 45 days for 2 years and every 3 months for an additional 3 years. Exact records are made each time. They note the visible findings of cervix, vagina, bladder, and rectum, and the palpable conditions of the uterus, parametria, and regional lymph glands obtained by vaginal and rectal palpation. The radium treatment is not repeated unless a recurrence has taken place.

The after-treatment also must comprise adequate drainage of the uterine cavity. Pyometra has been frequently observed. In such cases, a soft rubber T drain is inserted into the uterine cavity after each removal of the radium carrier and continued for several weeks after termination of the treatment, until the secretion is reduced to a clear and negligible amount.

Three to four weeks after treatment a careful examination reveals a visible and palpable decrease of the cancer area. The cervix shows local healing. The uterus is palpable and movable, the parametria are softer in consistency, reduced in size and again movable and very often rendered free of any induration.

Such favorable results can be obtained only by a careful selection of cases. The cases are divided into five groups: (1) cases which are clearly operable after a physical examination; (2) cases which are doubtfully operable, "the borderline cases"; (3) cases in which an operation is absolutely impossible; (4) cases so far advanced that all treatment is hopeless; and (5)

cases in which there has been a recurrence after abdominal panhysterectomy. The technique described is indicated and can be successfully applied only in cases of groups 2 and 3. It is absolutely useless in cases of group 4, the terminal cases. It is impossible of execution in cases of group 5 on account of the absence of the uterus. Cases in group 1, of course, are subjected to abdominal panhysterectomies after a preliminary radiation.

Properly selected cases reveal a visible and palpable subsidence of the cancer growth after a correctly applied radium course. A panhysterectomy could be easily performed. The operation would not present unsurpassable technical difficulties. Could the dangers of an added operation hold out to the patient a more favorable prognosis? Out of a total of 208 uterine cancers treated from April 1, 1914, to April 1, 1920, with radium, 22 cases were assigned to group 2 and 82 cases to group 3. Thirteen of group 2 were subjected to an abdominal panhysterectomy after a recession of the diseased tissues to an apparently normal state after radium treatment. Of these. 5 are living and 5 have succumbed to the operation and 3 did not report. Nine of group 2 were treated with rays only—7 are alive and well, and 2 have died. Sixteen cases of group 3 were subjected to panhysterectomies after an apparently local healing. Two of these are living, while 10 have succumbed and 4 did not report. Twenty-five cases were subjected to an excochleation, cauterization, and radium treatment. Four cases are living, but 9 died and 12 did not report. Forty-one cases were treated with radium only. 18 of these are well and free of recurrence, while 11 died and 12 did not report. See Tables 1, 2, 3, 4 and 5. They also state the time elapsed since treatment of those living and known dead. Patients treated with radium only and not subjected to panhysterectomy, excochleation or cauterization have a better chance all around.

If local healing is obtained we should not subject the patient to an unnecessary operation. Preliminary excochleation and cauterization also do not offer the patient any additional benefits. They render her chances less favorable in spite of the added physical and material sacrifices.

Recurrences after a local healing of the carcinoma with radium appear within 6 to 9 months, rarely later, following the termination of the treatment. It is a noteworthy fact that such recurrences are very refractory to radiations, probably due to the heavy connective-tissue reparative process. Exceptionally an arrest and recession of the recurrence may take place. If the growth does not react to the treatment and if the recurrence is confined to the uterus, we then advise surgical eradication. Should the recurrence appear in the regional lymph nodes we have subjected the patients to laparotomy, buried canals into the tumor masses, in which we placed rubber tubing. The tubes are secured with silk stitches to the parietal peritoneum of the posterior abdominal wall and also to stab incisions in the anterior abdominal wall. The length of the tubes must be carefully determined. The radium applicators are secured to a heavy silver wire which easily adapts itself to the course of the tubing. Two to four applications of 50 milligrams radium element of 10 hours each and intervals of 12 to 36 hours between applications are given.

We have subjected 5 patients to the procedure without any apparent benefits. Two patients succumbed to peritonitis. Three had a tedious convalescence. Of the latter one succumbed 6 weeks later. She had a large metastasis in the liver. Another one expired 6 months later from a carcinomatosis. The third one reported not to be relieved and has not been heard from since. In spite of these discouraging results we will continue the treatment in specially selected cases of such recurrences.

EXPERIMENTAL LIGATION OF THE HEPATIC ARTERY

A Preliminary Note

By MOSES BEHREND, M.D., Philadelphia

THE death of the patient in the case reported below led me to make a study of the experimental ligation of the hepatic artery.

Morris Blumfield, age 12, admitted to the Mt. Sinai Hospital, May 6, 1919. The child had been run over by a wagon, the wheels apparently having passed over the region of the epigastrium. Although no signs of an external injury could be seen, t was evident that the boy was suffering from a severe internal injury. He was shocked; his abdomen was rigid throughout, but more marked rigidity was present in the upper abdomen. A diagnosis of internal hæmorrhage was made. On opening the abdomen in the epigastric region the peritoneal cavity was found filled with blood. A careful search for the bleeding revealed a severed hepatic artery. The caudal end was bleeding profusely, the cephalic end was plainly seen and practically no blood was coming from it. Both ends were tied and the abdomen was closed without drainage. The boy did very well for 10 days, and we were hopeful of his ultimate recovery, but on the eleventh day there was a perceptible change in the facies. Some jaundice was present and signs of progressive emaciation were evident. He vomited occasionally. He presented the picture of an individual suffering from acute yellow atrophy of the liver. He died on the fourteenth day after operation. No postmortem was obtained.

Fig. 1. Showing the effects of ligation of the hepatic artery in a rabbit. Necrosis of the liver. The cardiac end of the stomach has been severed and turned over the stomach to show the ligature on the hepatic artery.

The writer was not satisfied as to the exact cause of death in this case, although he was of the opinion that ligation of the hepatic artery was responsible. As this could not be proved by autopsy, it was decided to reproduce the injury in animals and watch the effect. Through the courtesy of J. Parsons Schaeffer, professor of anatomy, Baugh Institute of Anatomy, Jefferson Medical College, an opportunity was given us to make this experiment. Professor Schaeffer allowed us the free use of his experimental laboratory, and his advice and co-operation assisted us greatly in the conduct of our experiments. Associated with me were H. E. Radasch and B. Lipschitz, the former doing the histological work, the latter assisting me at the operations. My thanks are due these coworkers for their valuable advice and assistance.

Our first experiment consisted in ligation of the main trunk of the hepatic artery. This artery was recognized by its course over the structures contained in the reflected portion of the gastrohepatic omentum. The artery is small but the operation can be greatly expedited if a pad is placed under the animal's back. This brings the structures around the foramen of Winslow nearer the surface.

The animal gradually failed, there was a marked loss in weight, the respirations became more rapid, and death occurred on the fifth

day following operation. At postmortem, a marked, acute yellow atrophy of the liver was noted (Fig. 1). There were deposits of yellow-stained lymph on the diaphragm and stomach. In order to prove that the hepatic artery had been tied the femoral and carotid arteries were injected with red-colored starch. It was also shown in the drawing that the arteries of the abdomen were all thoroughly injected, but that the injection stopped at the point of ligation.

This operation was performed up to the present time on eight animals and all succumbed in from 24 hours to 5 days. The pictures presented at autopsy were like that shown in the illustration, but in varying degrees of intensity.

In a few of the experiments the right or the left hepatic artery was tied. This resulted in giving us the same picture but the lesion was limited to the area supplied by the branch tied at operation.

Coincidently with these experiments our studies in the anatomical laboratory of the Daniel Baugh Institute were conducted. The illustrations[1] showing the hepatic artery in close relation to the cystic duct (6 per cent in the cadaver) impressed upon us the importance of a knowledge of the anatomy and of the variations of these structures which are found in the region of the foramen of Winslow.

There is no doubt in the author's mind that some unexplainable deaths following the operation of cholecystectomy may be due to the ligation of the hepatic artery. This can be avoided by opening at operation the gastro-hepatic omentum.[2]

Upon completion of these experiments and others relating to the gall-bladder and ducts, a full report of the findings will be given.

[1] J. Am. M. Ass., 1919, lxxiii, 892-895.

[2] The reader is referred to a paper to be published shortly in the Journal of the American Medical Association, illustrating this point.

DEPARTMENT OF TECHNIQUE

THE UTILITY OF THE RUBBER TUBE IN INTESTINAL SURGERY

By D. C. BALFOUR, M.D., F.A.C.S., Rochester, Minnesota

THE difficulties which not infrequently confront the surgeon in carrying out operations on the large and small intestine are to a considerable degree overcome by his familiarity with the established principles of intestinal surgery, his ability to employ technical methods of proved value and to utilize the various mechanical devices which, in the development of the surgery of the gastro-intestinal tract, have been devised to meet special conditions arising during the course of the operation. Of such mechanical devices the rubber tube deserves, I believe, more general and favorable recognition than is at present accorded it. Its usefulness in certain intestinal operations has been so evident, and the result of such operations so gratifying, that it seems advisable again to draw attention to these facts by presenting abstracts of case reports which are representative of some of the conditions under which we have employed the rubber tube, and which illustrate the utility of the tube in intestinal surgery.

Such operations as resections of the sigmoid, rectosigmoid juncture, or upper rectum for malignancy, are and always will be frequently of considerable technical difficulty and of relatively high risk. In our experience in the Mayo Clinic the rubber tube has been an important factor in minimizing such difficulties and risks, and it was in certain cases in this group that the tube was first employed as an aid in accomplishing a safe axial anastomosis. Its value, under these circumstances, had been recognized for several years; Rutherford Morison, Lockhart Mummery and other English surgeons, were early advocates of its merit, and it had been employed in the Mayo Clinic for some time previous to 1910, when I described the technique of "tube-resections" of the sigmoid as then carried out in the clinic. Since that time certain modifications in the operative technique then described have been found advantageous; and, as is so frequently true, the higher efficiency which has come from such improvement in technical methods has made possible not only better results, but a definite increase in "operability." We have accepted as operable and successfully removed malignant tumors of the lower sigmoid or upper rectum, the operability of which, without the aid of the tube in the operation, would be at least highly questionable.

The tube used in such cases is ¾ inch in diameter with ½ inch caliber, with a lateral eye about 1 inch from its upper end. After the resection is made, the surgeon introduces the tube through the open end of the lower segment and passes it downward through the rectum and anus. There it is secured by an assistant and traction exerted upon it until the upper end of the tube is brought below the level of the cut end of the lower segment. The two ends of bowel are now approximated, properly aligned, and fixed by a stay suture in the middle of one lateral wall and a second stay suture at a corresponding point at the opposite side. At this latter point a heavy chromic catgut suture is begun. This suture is introduced from the mucous side and includes the mucous and muscular layers of the intestinal wall and is continued posteriorly in this manner until the stay suture, which was first placed, is reached. Our experience has been that if No. 2 chromic catgut is used and special care is taken to approximate the mucous membrane so that it does not extrude outside the bowel wall, a most satisfactory

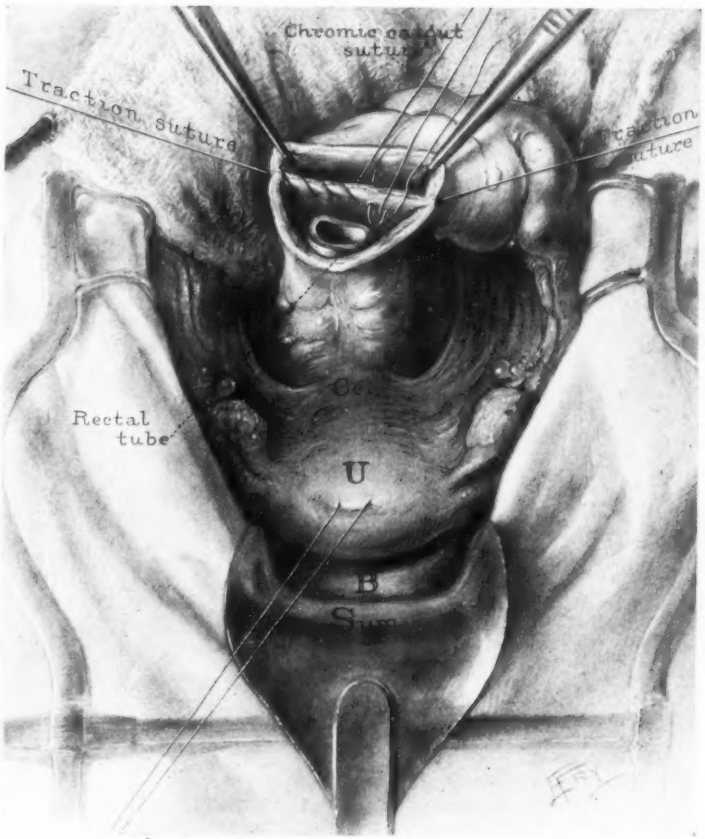

Fig. 1. Beginning of posterior suture line.

closure posteriorly can be secured (Fig. 1). When the circular anastomosis is completed in the usual manner by a continuation of this chromic catgut suture, the tube is passed up the bowel by the assistant until it reaches a point from 3 or 4 inches to 1 foot above the level of the anastomosis. The correct height of the tube must be gauged by the ease with which it takes its position in the upper segment. The tube, resting in its best position in the upper segment, is secured by a suture of heavy catgut placed close to the anastomosis line, so that the suture will be invaginated with the anastomosis later (Fig. 2). The invagination, which we believe to be a very important feature of the operation, is then made by grasping the lower segment with fine toothed forceps at a point of about 1 inch below the line of anastomosis; and by means of these forceps the lower segment is supported while the assistant pulls downward on the tube until the anastomosis line is drawn into the lower segment, and the anastomosis is completely covered (Fig. 3). The loose ring of the lower segment is then fixed to the upper segment by three or four interrupted sutures (Fig. 4). The bowel, at the site of the anastomosis, then has the same appearance as that of a small intussusception. In some cases it is not possible to produce such an invagination because of the extent of the resection, and in some instances it is

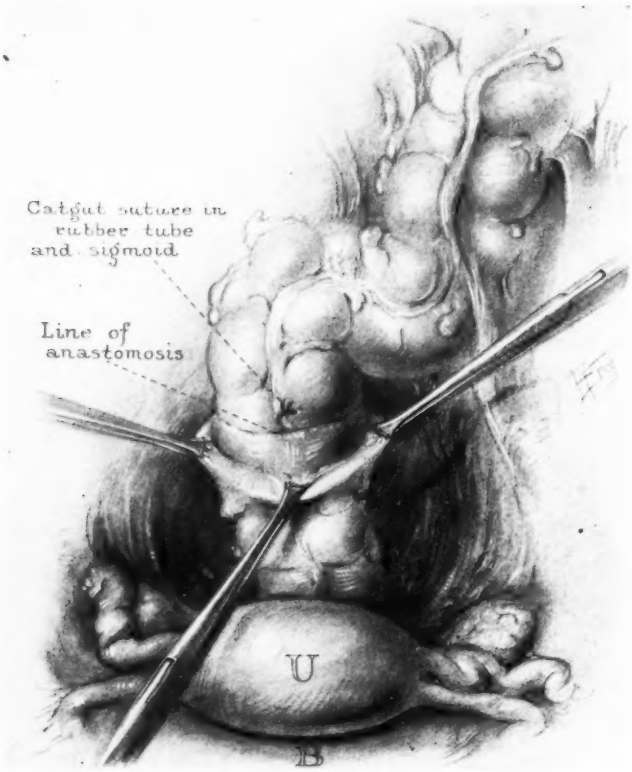

Fig. 2. Anastomosis completed; bowel ready for invagination.

not even possible perfectly to unite the two ends of the bowel over the tube. It is surprising, however, to observe the excellent immediate and ultimate results in such unsatisfactory cases; and even in cases in which a visible defect in the line of the anastomosis was present (usually on the posterior side) a satisfactory convalescence has ensued. When a fæcal fistula does occur, spontaneous closure can be anticipated. In the majority of cases it is quite safe to close the abdomen without drainage.

REPORT OF CASES

RESECTION FOR CANCER OF THE SIGMOID

CASE 1 (A261807). Miss E. E. H., age 26, presented herself at the clinic February 27, 1919. She gave a history of having had symptoms suggestive of a partial obstruction of the large bowel, beginning December, 1918; these symptoms became more definite and severe until January, 1919, when obstruction was complete and operation imperative. The surgeon, finding the obstruction in the sigmoid due to a mass apparently malignant, considered any attempt to remove the tumor inadvisable and performed a colostomy. Six weeks later the patient arrived at the clinic in fairly good physical condition and with only a moderate weight loss. Examination showed a well functionating colostomy and a mass in the left pelvis which could be easily outlined, both by vagina and by rectum. An X-ray examination showed an obstruction of the colon about 5 inches above the rectosigmoid. The absence of any evidence of metastasis, the good condition of the patient and, particularly, our previous experience in such cases, led us to advise exploration. March 6, 1919, an abdominal exploration was made (W. J. Mayo). An incision 1 inch to the left of the midline gave easy access to the growth in the sigmoid. The growth proved to be a constricting cancer, of the napkin-ring variety, situated about 4 inches

above the rectosigmoid juncture. Resection seemed feasible and, after the separation of the colostomy from the abdominal wall, a portion of the sigmoid, including both the colostomy and the growth, was removed. Because of the firm attachment of the sigmoid to the left ovary and tube, it was necessary to remove both of these structures. An end-to-end union was then accomplished over a tube in the manner described above; the former abdominal incision was widely excised before closing, and two rubber tissue drains were carried down to the site of the anastomosis. The patient had a most satisfactory convalescence; the tube was removed on the eighth day, and both the new incision and the former incision were healed when she left for home three weeks after operation. Her present condition is excellent, and, although malignancy at such an age is associated with a gloomy prognosis, some prospect of cure can be entertained.

CASE 2 (A185641). Mrs. H. C. L., age 41, came to the clinic February 14, 1917, giving a history of symptoms of obstruction of the sigmoid over a period of the past 22 months. A mass could easily be identified in the suprapubic region, and on bimanual examination it proved to be in the left pelvis. Exploration was carried out February 24, 1917 (J. C. Masson). A cancer of the left rectosigmoid was found, the mass being adherent to the uterus, the left broad ligament, and the left lateral wall of the pelvis. It had all the characteristics of a malignant process and was clearly inoperable. Colostomy was done and radium treatments advised. In January, 1918, the patient had 1600 milligram hours, in August, 1900 milligram hours, and in January, 1919, 4200 milligram hours. At each examination the mass was distinctly smaller, with a corresponding decrease in symptoms, such as pain and discharge. In November, 1919, the patient returned to the clinic, requesting to have the colostomy closed. She was in excellent general health, weighed 224 pounds, and the absence of symptoms showed, at least, that the former malignant mass was inactive. On examination of the lower segment through the colostomy opening, the finger could not be passed because of the contraction which had taken place beyond the site of the former growth. Bimanual examination showed a small nodular movable mass high in the pelvis. A second operation was, therefore, performed November 15 (J. C. Masson). The portion of the sigmoid in which the radium had been used was in an atrophic condition, with marked thickening of the intestinal walls and, because of the extent of this induration, it was necessary to remove about 14 inches of the colon; the resected portion contained the colostomy and the thickened bowel. The operation was unusually difficult because of a short lower segment, the patient's obesity, and the fixity of the segments of intestine. The anastomosis, however, was finally accomplished over a rubber tube by interrupted sutures of chromic catgut, the bowel being intussuscepted about 1 inch. The anastomosis was carefully protected by suturing the omentum over it, and the uterus fixed to the anterior aspect of the anastomosis. It was difficult to determine from the gross appearance of the sigmoid whether or not any active cancer cells were present; it was very interesting, important, and gratifying to find that repeated pathological examinations did not show any evidence of malignancy. The wound was closed without drainage; the patient made a satisfactory convalescence, and left for her home December 17, 1919.

Fig. 3. Final relationship of the bowel and rubber tube (diagrammatic).

RESECTION FOR DIVERTICULITIS OF THE SIGMOID

CASE 3 (A35613). Mrs. J. G. F., age 52, had had an exploratory operation elsewhere in March, 1909, because of symptoms referable to the sigmoid region; and at the exploration three diverticula were observed in the sigmoid over an area of about 2.5 inches. A conservative operation was done, but leakage developed at the site of the operation and a

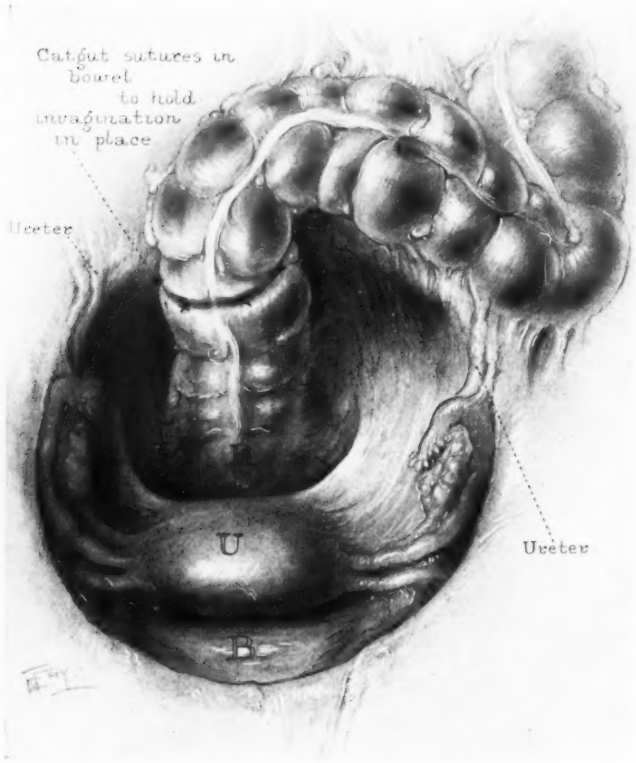

Fig. 4. Operation completed.

fæcal fistula persisted and was chiefly the reason for which the patient presented herself at the clinic. Exploration (the closure of the fistula being the primary object) was clearly advisable, and was done March 24, 1910 (C. H. Mayo). A diverticulitis of the sigmoid was found which was adherent to the small intestine and connected with a small abscess in the abdominal wall. After the separation of these various adhesions, the sigmoid was resected and an anastomosis carried out by the tube method, as described above. The patient made a most satisfactory convalescence and has remained well.

The tube, then, can be used in certain cases of diverticulitis in a manner similar to that described, but it is not employed so frequently as in operations for cancer of the sigmoid because of the fact that the mass in diverticulitis is usually in the upper sigmoid and can be mobilized without much difficulty. Resection therefore, is usually made in diverticulitis by the Mikulicz three-stage method and when immediate axial anastomosis is indicated the procedure is not particularly difficult.

In cases in which primary resection is advisable, a satisfactory and safe method to employ is that advised by C. H. Mayo. After a circular anastomosis has been accomplished in the usual manner, the entire anastomosis line is drawn through an opening made at a suitable point in the omentum and attached to the peritoneum at the incision in such a manner that the suture line shows after the peritoneum is closed.

The wound can then be closed without drainage, or, if it is preferred, with mural drainage. This method has given us most satisfactory results. The general abdominal cavity is effectively walled off by the omentum; and, should any leakage occur, such drainage has no difficulty in finding its way into the incision.

REPAIR OF FÆCAL FISTULA

CASE 4 (A291805). Mrs. M. A. H., age 46, came to the clinic October 3, 1919, because of a fæcal fistula. An abstracted history shows that she had been perfectly well until about 2 years before when she had an attack of severe abdominal pain in the left lower abdomen lasting 3 or 4 hours, which was to some extent relieved by hot applications. Until May, 1919, she continued to have these attacks, which usually lasted about 3 or 4 hours and occurred at intervals of 3 or 4 months. In May, 1919, an attack developed as usual apparently, but could not be relieved by the usual measures, and after it had continued for about a week the patient was operated on elsewhere and 6 inches of the sigmoid resected, anastomosis being made by means of the Murphy button. The pathologic report made at the time on the specimen excised was "small round-cell sarcoma." The patient developed a fistula 3 days after the operation, suffered a great deal of general pain throughout the abdomen, and failed to show any improvement. In the physical examination carried out at the clinic on her arrival, the chief finding was a mass in the right pelvis, apparently on the rectal shelf, of a rather nodular character, and considered to be a recurrence of the malignant process. It seemed advisable to explore, however, and to close the fistula if feasible. Exploration was carried out October 24, 1919 (W. E. Sistrunk). Fortunately no evidence of malignancy could be demonstrated. The mass which could be palpated before operation, proved to be an induration due to scar tissue which appeared to be the result of the previous operation. The dissection of the fistulous tract led to the site of the former operation and at this point in the sigmoid there was considerable thickening and the bowel was firmly adherent to the posterior wall of the uterus. Having liberated the bowel, it was necessary to excise the segment of indurated sigmoid, which was a matter of some difficulty because of the firm inflammatory changes which had taken place. Anastomosis was made over a tube in the typical manner, the tube being of particular assistance because of the fixity of the segments of bowel. The patient had a very satisfactory convalescence; a slight difficulty in the passage of fæcal matter through the tube was overcome by the manipulation of a catheter through the rectal tube.

USE OF THE TUBE ALONE IN CHRONIC AND SUBACUTE OBSTRUCTION

CASE 5 (A177159). Mrs. J. D., age 39, came to the clinic November 6, 1916, complaining of attacks at irregular intervals of great abdominal distress due to an enormous distention of the abdomen with gas, with marked respiratory distress and cardiac pain. The attacks lasted frequently for from 2 to 4 days and were associated with a great deal of pain in the joints, especially the legs and shoulders. The patient was rarely entirely free from distress, although there were periods of from 12 to 24 hours when she was reasonably comfortable. Gas was expelled by rectum and through a fistula which existed in one of the abdominal incisions. The significant findings in the physical examination were the marked abdominal tympany, associated with visible intestinal peristalsis, four scars of previous abdominal operations, and general evidences of chronic infection, particularly in the joints of the feet and hands. The history leading up to the present condition was, chiefly, that 4 years before, following a severe attack of abdominal pain, the appendix, uterus, and some gall-stones were removed elsewhere. Four weeks later it was necessary to do an ileosigmoidostomy because of obstruction. For the following years the patient had comparatively good health, but finally the intestines became obstructed again with formation of the fæcal fistula and in May, 1916, she was again operated on. The fistula was closed and several loops of small intestine liberated. Following this operation the patient continued to have the symptoms which have been described. At operation November 17, 1916, (E. S. Judd), a condition of general intestinal paresis was found. No point of definite obstruction could be determined. The small intestine, the cæcum, and the transverse and descending colon were especially dilated. Because of the repeated operations and the general character of the obstruction, there was apparently no method of anastomosis by which a good result could with certainty be accomplished. A long rectal tube was passed by rectum through the existing anastomosis and continued for about 18 inches into the small intestine. Immediately a great quantity of gas and fæcal matter passed, and it was decided to leave the tube in place as long as possible in the hope that in the inevitable reformation of adhesions it would act in the rôle of a splint, and would support the bowel so that disabling deformity would not later occur. In a recent report the patient states that she has remained well and free from the intestinal disturbances for which the operation was carried out.

This case is a striking illustration of the value of the tube in those cases of chronic or subacute obstruction developing as a late result after repeated operations. When the tube can be employed in such cases the uncertainty, which is so frequently felt by the surgeon, is converted into an assurance that the segment of the intestine which has been supported by the tube will be so molded in the new mat of adhesions that future obstruction at that point is most unlikely to occur.

A case similar in some features to the foregoing one, and having added points of interest, is the following:

CASE 6 (A253595). Miss M. G., age 20, came to the clinic December 16, 1918, with a complaint of

suffering daily from great accumulations of gas. This bloating usually came on between 4 and 6 in the afternoon; belching huge quantities of gas and slight vomiting usually gave partial relief. On two occasions the patient had attacks of abdominal cramps, apparently of great severity; these were also relieved when the gas was expelled. The patient was a rather unhealthy appearing girl, but no evidences of gross disease could be determined. The abdomen was greatly distended and repeated purgation together with daily doses of belladonna failed to make any appreciable change in the distention. An X-ray examination showed a hugely dilated stomach, the bismuth remaining in the stomach for three days, and, although it was not possible to demonstrate positively that a pyloric lesion was present, surgical interference seemed indicated.

On January 2, 1919, an abdominal exploration was done (D. C. Balfour). General exploration immediately confirmed the physical examination and the X-ray findings. The stomach was dilated to great size, the lower border reaching almost to the symphysis. No actual lesion could be found at the pylorus to account for the obstruction, it apparently being due to a mass of adhesions extending from the hepatic flexure to the duodenum and pylorus. Beside this tremendous dilatation of the stomach was a dilatation of the proximal half of the large bowel, this portion of the colon being doubled on itself by another wide band of adhesions, stretching from the middle of the ascending colon to the left half of the transverse colon. The proximal half of the colon was dilated to about 10 or 11 inches; the distal half was little more than normal size. The primary cause of these two conditions was not evident. In the absence of any visible lesion, the most plausible explanation seemed to be that either a congenital abnormality in the rotation of the colon or some inflammatory process in childhood had left the colon in such a relationship that strong bands of adhesions were developed to the point of causing chronic obstruction and producing secondarily, from traction and trauma, the adhesions to the pylorus and duodenum. It seemed unwise, in any event, to attempt any prolonged investigation (because of the risk to the patient and the uncertainty of securing any important information) to learn the cause of the condition, and this decision was strengthened by the fact that it was perfectly clear what was necessary to be done to meet the symptoms of which the patient complained. Gastroenterostomy was first performed, followed by colocolostomy, the latter anastomosis being made between the tremendously distended cæcum and the normal sigmoid. A large rectal tube was passed through the anus, rectum, and anastomosis until the end was about 1 foot above the level of the colocolostomy.

The patient had a satisfactory convalescence, and has had complete relief from all the symptoms of which she complained.

RESECTION OF TRANSVERSE COLON

Case 7 (A263828). Mrs. N. W., age 50, came to the clinic in March, 1919, chiefly because of discomfort which had begun in the epigastrium about three weeks before. This discomfort was usually associated with nausea, but vomiting occurred on only one occasion. The pain had never been severe and radiated only to the lower abdomen; temporary relief was secured on defæcation. There had been no diarrhœa nor abdominal colic. The patient also stated that for a period of thirty years she had been distressed occasionally by a dull, bloated feeling in the epigastrium, usually immediately after taking food. The character of the distress, which had developed recently, its radiation to the lower abdomen, and the relief on bowel movement, suggested the possibility of intestinal obstruction. An X-ray of the colon demonstrated a cancer involving the hepatic flexure and the first part of the transverse colon. Exploration was, therefore, advised and carried out March 4, 1919 (J. D. Pemberton). A huge cancer of the transverse colon was found, involving the glands in the transverse mesocolon. The growth had penetrated the serosa of the bowel and there was free fluid in the abdomen. A hard nodule at the anterior edge of the liver was excised and found to be a mass of gall-stones, which had become encysted following a perforation of the fundus of the gall-bladder into the liver substance. A resection of the transverse colon well away from the tumor was done and a direct end-to-end anastomosis made by the C. H. Mayo method, followed by a partial cholecystectomy with drainage of the gall-bladder. At the completion of the operation, the anus was dilated and the rectal tube inserted and left in until the twelfth day. The patient made a satisfactory convalescence and has shown no evidence of a recurrence up to the present time.

It is advisable under certain conditions to provide a safety valve for the large intestine to prevent spasm of anal or rectosigmoid sphincters at a time when distention of the colon should be guarded against. A rectal tube serves such a purpose excellently and may often be resorted to in place of a colostomy or appendicostomy.

CLOSURE OF COLOSTOMY

Case 8 (A253976). Rev. J. J. L., age 48, came to the clinic December, 1918, because of a tumor in the left lower abdomen, attacks of pain, and partial obstruction for the past 2 years. The most recent attack was about 1 week before the examination in the clinic; the tumor had first been noted at this time. Three months before he had had a severe hæmorrhage of bright red blood; two other such spells of bleeding had occurred up to the time of his examination. A diagnosis of duodenal ulcer had been

made elsewhere. The physical examination disclosed a hard mass which could be readily palpated both through the abdominal wall and bimanually. The X-ray confirmed the clinical diagnosis of cancer at the rectosigmoid juncture. The patient was operated on December 12, 1918 (W. J. Mayo). A Mikulicz three-stage operation was done. A satisfactory convalescence ensued, and, January 11, a clamp was applied to the spur of the sigmoid. The further convalescence placed this patient in the small group of patients in whom the bowel does not completely close after the routine three-stage Mikulicz operation, and in April, 1919, he returned. An extraperitoneal closure of the colostomy was done over a Smithies stomach tube, which was introduced through the colostomy and pushed down through the anus, with the upper end about 2 inches above the point where the bowel was closed. This procedure completed the satisfactory result; the patient is at present apparently in perfect health.

Ineffective attempts to close colostomies are occasionally met with. Successful closing sometimes requires enough suturing of the opening in the bowel to constrict the lumen beyond what appears to be the limit of safety. The tube serves a useful purpose by preventing further contraction; and by conveying gases and fæcal matter past the point of closure it gives the best possible condition under which healing may occur. In such cases the tube is introduced through the colostomy and passed out of the anus, leaving the upper end about 3 or 4 inches above the point of closure; it is removed in about 10 days.

The foregoing abstracted cases illustrate the wide utility of a rubber tube in intestinal surgery, and I am convinced that further experience in extending its use will show that in the past we have occasionally overlooked its value because we have failed to recognize, or have forgotten, certain sound principles in the surgery of the gastro intestinal tract. Such principles could have been well carried out in certain cases by the use of the rubber tube. The mechanical functions of the tube are chiefly called upon in its employment in axial anastomosis, closure of colostomy, and fæcal fistula repair. In such cases, its first service, as I have pointed out, is the prevention of gross leakage from an insecurely closed intestine. We have repeatedly met with cases in which the extent of bowel resected has been so great or the segments so fixed, or for both reasons, that approximation has been made difficult and an unsatisfactory union has resulted, on the mesenteric side particularly. When, however, such an anastomosis has been made over a good sized rubber tube the results have been unmistakable evidence that the tube, immobilizing the two segments of bowel as it does, gives protection against leakage, because of the security against undue tension, with the possible results of a weakened or ruptured suture line. Fæcal fistulas which occur under such circumstances have been insignificant, as a rule healing spontaneously in a short time.

A further and most important mechanical function of the tube is observed in its actions as a splint. The danger of postoperative obstruction is always to be considered in those cases in which extensive scar due to previous operative interference or the adhesions of inflammatory exudates are present, for in the inevitable reformation of adhesions, the bowel may be fixed in such a manner that immediate or later obstruction is possible. In such cases, the tube within the bowel prevents any kinking or malposition which might occur in the reorganization of the exudative products which takes place in the first few days after operation. The value of the tube under such conditions is well illustrated in Case 5, in which the operation, which was anticipated to be of unusual difficulty, high risk, and dubious results, proved to be one of greatest simplicity, little danger, and complete success. It should be remembered that in the tube we have available a means of carrying the contents of the intestine through a point of actual, impending, or potential obstruction in the intestinal tract, and that it can serve a most useful purpose in cases in which such danger is a possibility.

The possibility that the tube may be of service in certain disturbances in the neuromuscular mechanism of the intestinal tract is suggested by Case 6; although the immediate cause of the condition was not due to spasm, the primary cause may have been. During the past few years only have we gained any accurate knowledge of the neuromuscular mechanism of the gastro-intestinal tract. The original investigations of Gaskell, and

the later work of Keith and Cannon, have resulted in establishing certain facts, the most important of which in the present connection concerns the presence in the gastro-intestinal tract of nodes or controlling sphincters. Variations in the functionating of these sphincters cause disturbances in the section of the alimentary tract immediately under its control, with secondary disturbances in segments higher up. The extent to which such disturbances (that is, tonic spasm, atony due to sympathetic irritation, or irregular contractions due to parasympathetic irritation) may be responsible by reason of long-continued action for actual disease in the gastro-intestinal tract and associated organs is yet to be determined. It is quite reasonable to believe, however, that abnormal functionating of such sphincters continued over a long period may, with the addition of other factors, result in disease processes which otherwise would not have occurred.

One of the most interesting anomalies in the intestinal tract is congenital dilatation of the colon or Hirschsprung's disease. No satisfactory explanation of the condition has been advanced, but, from the character of the dilatations which occasionally occur in other portions of the intestinal tract, it seems that chronic spasm of the rectosigmoid sphincter is an important factor in the development of the condition. If this be true, it is possible that in certain cases of Hirschsprung's disease, some method may be devised for forcible and repeated stretching of the sphincter at the rectosigmoid juncture, by instrumentation similar in principle to that so successfully used in cardiospasm. Should such treatment be possible, a formidable operation could be avoided.

Another point of interest to be mentioned in this connection is the suggestion which has been made by Sampson Handley in his article on ileus duplex. He believes that certain cases of postoperative intestinal paresis with general peritonitis are due to spasm, not only of the long sphincter in the terminal and pelvic ileum, but also of the sphincter in the termination of the pelvic colon (or at the rectosigmoid juncture), and that the percentage of recoveries from operations in such cases will be much higher if both the distended and obstructed ileum and colon are drained than if an enterostomy only is done. He accomplishes this procedure by an ileocolic anastomosis (ileum to ascending colon) combined with cæcostomy. In this manner he makes certain that in the 33.3 per cent of cases in which both ileum and sigmoid are obstructed a safety valve is provided in the catheter colostomy. We have found that in some of these cases a tube introduced through the rectum could be passed beyond the point of spasm at the rectosigmoid, thereby avoiding the necessity of a colostomy. In certain cases of paresis, the anastomosis of ileum and colon, rather than enterostomy, should be given more consideration than has been afforded it in the past.

The various conditions under which we have employed the tube frequently necessitate serious and difficult operations in which any factor which adds to the safety of the operation and to the prospects of a satisfactory result is most desirable. It has been our experience that in the rubber tube such a factor is available.

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A SELF-FILLING SYRINGE FOR LOCAL ANÆSTHESIA[1]

By W. WAYNE BABCOCK, M.D., F.A.C.S., Philadelphia

LOCAL anæsthesia by weak procaine-epinephrin solution, the safest of all methods of anæsthesia, has failed to receive the acceptance it deserves, partly because it is technically inconvenient and partly because operators have so often used drams or ounces of solution when pints are required. The surgeon who, for a gall-bladder operation on a very obese patient, depends on two ounces of solution, will never become so enthusiastic over local anæsthesia as will the operator who after carefully narcotizing the patient with morphine and hyoscine injects from a pint to two quarts of the solution and is rewarded by having his patient doze peacefully during the operation and leave the operating table in better condition than when he was placed on it.

The injection of large quantities of solution by the usual method is not only time consuming, but tiresome to the operator's hand. If a syringe of large capacity be used, the pressure required makes the injection difficult; while the use of a small syringe necessitates such frequent refilling as to make the procedure tedious. The method of injection by a hand syringe has in our opinion important advantages over the use of pressure injectors. The operator senses the character of tissue injected by the resistance encountered, is always aware of the rapidity of the injection, and above all has instantly available by slightly withdrawing the piston, a test as to the penetration of a blood vessel. The simple modification of an ordinary record syringe herein illustrated has been found very useful in a series of extensive operations under local anæsthesia upon the peripheral nerves, the brain, spinal cord, joints, bones, the neck, chest and abdomen.

A five or ten cubic centimeter record syringe is modified by drilling the piston and introducing a one way valve (Fig. 1). For the solid piston rod a small tube is substituted, the free end of which is fashioned into a comfortable ring for the operator's thumb, having a small hose connection. Two finger rings are brazed to the upper metal fitting of the syringe. For use the syringe is connected by about 1½ meters of small (2 to 4 millimeters) rubber tubing to a 250 cubic centimeter burette filled with the anæsthetic solution and hung about 125 centimeters above the level of the patient. All air having been expelled from the apparatus, the needle is introduced into the tissues, and the injection started, the syringe filling on each withdrawal of the piston.[1] During the infiltration the operator tests for the puncture of blood vessels by occasional short, sharp withdrawals of the piston, the appearance of blood in the syringe warning him that the needle must be moved before the injection is continued. With this syringe 500 cubic centimeters of solution may be injected into the tissues in three minutes with very little fatigue. Should the operator desire to use solutions of different strengths, two burettes with an appropriate Y connection are employed (Fig. 2). Satisfactory syringes of this type are made by Lentz and Sons and the Harvey R. Pierce Company, of Philadelphia.

Where a succession of operations under local anæsthesia is to be performed, only the syringe, needles, and connecting tubing need be re-sterilized between the operations. The double burette-holder figured, is designed to facilitate this; the syringe holding arm and adjacent tubing being detached for re-sterilization between operations.

We employ a one per cent, and one-quarter per cent, solution of procaine (novocaine) containing one part to 100,000 of epinephrin (about ¼ tablet or 4 minims of 1:1000 epinephrin to each 30 cubic centimeters) in decinormal salt solution, and consider 500 cubic centimeters of a 1 per cent or 2000 cubic centimeters of the ¼ per cent solution about the maximum quantities to be employed. We have exceeded these amounts in a number of cases, however, without untoward result. In operating upon a shocked, toxic, exanguinated, or dehydrated patient, the rather lavish but skillful use of local anæsthesia is

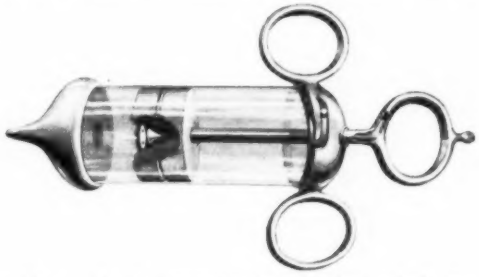


Fig. 1. Modified record syringe showing conical valve in piston. The valve which should be of thin metal, may readily be removed for cleansing, by unscrewing the small perforated plate.

[1]Developed at U. S. General Hospital No. 6, Fort McPherson, Atlanta, Georgia, Colonel T. S. Bratton, Commanding.

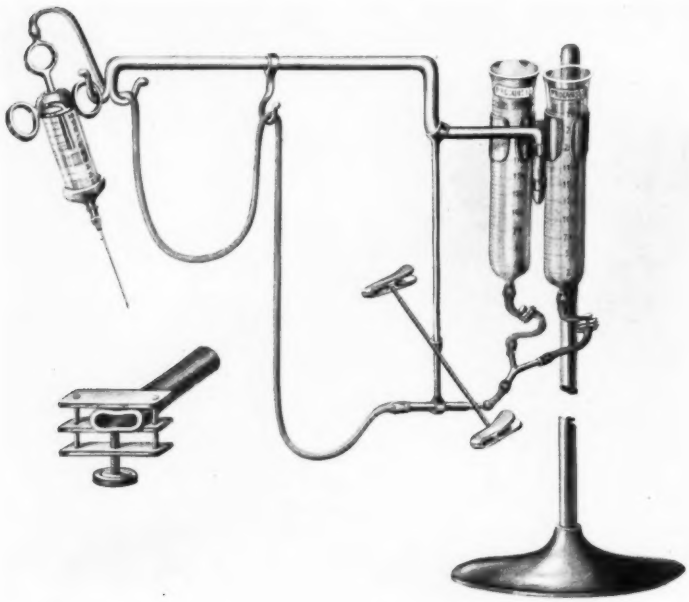


Fig. 2. The syringe apparatus for local anæthesia assembled for use. The syringe support and the tubing anterior to the Y connection, may be detached for resterilization between operations. The spring clips serve to hold a towel to separate the sterile from the non-sterile portion of the apparatus.

of exceeding value, the patient's condition often showing progressive improvement during the course of the operation. The epinephrin greatly increases and prolongs the action of the procaine. In a complicated multiple nerve anastomoses we have operated for four and one-half hours without return of sensation. In operations upon the upper extremities, we think it often advisable to precede the local infiltration by blocking the brachial plexus after the plan of Kulenkampf, especially where extensive operations upon the nerve trunks, bones, or joints, are to be carried out. With a simple efficient apparatus for giving ample quantities of the local anæsthesia always at hand, the surgeon will turn to this method more and more for its hæmostatic and stimulating action as well as for the analgesia. Its hæmostatic action is especially valuable in operations upon the skull, obviating the need of a tourniquet.

With the safety and efficiency of procaine-epinephrin, there is, of course, no justification in using cocaine for infiltration anæsthesia.

The syringe after each operation is disassembled, washed, and left submerged in a 10 per cent formalin solution in a saturated aqueous solution of borax. Immediately before use the syringe is rinsed in sterile water. The needles, tubing, and other portions of the apparatus are sterilized, by boiling, or in the autoclave. We have discontinued boiling record syringes on account of the breakage. To be efficient the valve should be of thin metal and very light.

A LARGE INACCESSIBLE VESICOVAGINAL FISTULA FOLLOWING HYSTERECTOMY

By JAMES A. CORSCADEN, M.D., New York City
From the Department of Surgery, Columbia University.

THE patient L. L., Hosp. No. 35253, age 52, unmarried, was in normal health, and had passed her menopause three years before admission to the hospital, June 20, 1917. Her illness began eight months before admission with a gradual onset of vaginal bleeding, at first pale, and later definitely bloody and sometimes clotted. This appeared at intervals varying in length up to 3 weeks, and persisted with the same irregularity. When she was not bleeding, there was a pink watery discharge. Several weeks before admission, she began to have dragging pains in the back and in the pelvic abdominal region, mild in severity, and more or less continuous, but worse at night. There was slight increased frequency of micturition. The patient had lost a little weight. There were no symptoms referable to alimentary, cardiovascular, muscular, respiratory or tegumentary systems.

The patient was referred for radium treatment with a diagnosis of uterine bleeding, due to menopause, and fibromyoma of the uterus.

Examination showed only slight enlargement of the fundus and a bloody vaginal discharge. Pre-operative diagnosis: carcinoma of the body of the uterus.

Operation, June, 1917. The uterus was curetted, and suspicious fragments of tissue removed; 50 milligrams of radium was inserted into the uterus and removed after 24 hours. Pathological report: adenocarcinoma of uterus.

Operation, November 12, 1919. Complete abdominal hysterectomy. Double salpingo-oophorectomy. Pathology The abdomen was negative except for the uterus, which was symmetrically enlarged to 8 by 6 centimeters. The anterior surface of the uterus seemed irregular. There was no extension into the broad ligments.

Procedure. The uterus was removed without dissecting the ureters. In going wide of the uterus anteriorly, the base of the bladder was entered, making an opening roughly 2 centimeters in diameter. An attempt was made to close this by two tiers of chromic stitches, which brought the bladder suture line directly over the opening into the vagina.

The postoperative course was smooth except that on the third day urine was passed by vagina, and continued in this manner until the last operation on November 12, 1917. At this time the findings were of virginal senile external genitalia with the vaginal orifice admitting the end of the little finger. After approaching the fistula, it was found to measure about 1.5 to 2 centimeters in diameter, easily admitting the index finger into the bladder. The margin of the fistula showed a bit of everted bladder mucosa.

Fig. 1. The incision.

Fig. 2. The incision completed and the fistula exposed.

Fig. 3. The denudation.

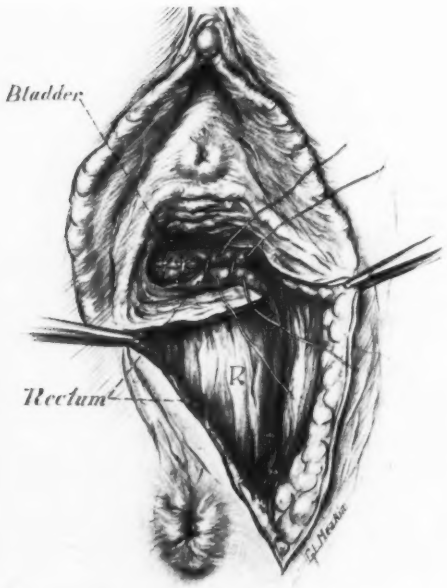


Fig. 4. First row of sutures has closed the bladder. Second row is begun.

Fig. 5. Third row of sutures has closed the mucous membrane and suture the incision has begun.

The posterior margin was against the rectum and corresponded to the reentrant angle of the vaginal vault.

Procedure. With the patient in the lithotomy position, exposure was obtained by Schauta's incision through the perineum extending laterally and posteriorly. It was readily seen that the bladder could not be freed laterally or posteriorly with any degree of safety, because of the nearness of the ureters, and the intimate adhesions presumed to exist between bladder, rectum, and small intestines. Therefore, inversion of the fistula had to be abandoned. In order to obtain a re-enforcement to the suture line closing the bladder, it was deemed necessary to bring muscle to muscle. Therefore, after trimming off the everted bladder mucosa, a cuff of vaginal mucous membrane was dissected off extending a centimeter and a half downward from the edge of the fistula. The fistula opening was closed by chromic mattress sutures with knots outside of the bladder. Two extra tiers of interrupted chromic sutures approximated bladder wall anteriorly to rectal wall posteriorly, and puckered the lateral pelvic tissues. The last row of sutures brought together the edges of the anterior and posterior vaginal mucosa, and sutured them in a horizontal line. This row of sutures was continued to the surface along the lateral vaginal wall, and along the skin in the line of the original incision.

Postoperative treatment consisted of keeping the patient in the absolute prone position for 6 days, and for another week as much of the time as this position could be tolerated. A self-retaining catheter was kept in for 5 days. Immediately after the catheter was removed, the patient began to void one to two hundred cubic centimeters and continued to pass increasing amounts until discharged, when the bladder would hold comfortably 250 cubic centimeters. She suffered considerably during the first four days from

bladder spasms. There was considerable pus in the urine for 10 days. No urine escaped through the vagina from the time of the operation until the latest report, which was December 25, 1919 (a little over two years after the first operation), when the patient reported that she had no symptoms.

The interesting points in the case are:

1. The patient was referred for bleeding of the menopause, although this bleeding began two and one-half years after her last period.

2. It is vitally important to do an exploratory curettage before introducing radium.

3. The rectal wall may be used to close in a vesicovaginal fistula when the uterus has been removed.

4. It is important to keep the patient, after repair of a vesicovaginal fistula, in the prone position for at least a week.

PLASTIC ABDOMINAL INCISION FOR COLOSTOMY

By G. MILTON LINTHICUM, A.M., M.D., F.A.C.S., Baltimore
Professor of Proctology, University of Maryland, College of Physicians and Surgeons, formerly Lieutenant Colonel, Medical Corps, U. S. A.

IN dealing with a rectal carcinoma, one is always confronted with the question as to what is advisable and as to the possibility of complete removal and permanent relief. The best manner of extirpation is still a much discussed question; whether one of the old extra-abdominal routes should be used, or the combined method, the latter probably being most in favor. There is a growing tendency, however, merely to give relief in an increasingly larger number of cases; for experience shows that the disease is often farther advanced than the superficial appearance would indicate.

The ill favor in which the artificial anus has been held is lessening with the more improved methods of tunneling under the muscles or skin as suggested by Witzel, Borchardt, Weir, and Tuttle, thus providing very satisfactory control of the new anal orifice.

It is not my purpose to present any argument as to the merits of any of these methods, but to suggest, in such cases as demand a permanent artificial anus, that which may be called a mortise and tenon skin incision which presents some advantages over the straight incision. This technique also possesses advantages in strengthening the usual coaptation in other abdominal incisions, such as for herniotomies, or in multiplying cross union in long abdominal incisions.

As the diagram shows, instead of being continued in a straight line at a mid-point, the primary incision for the artificial anus is diverted to one side, so as to form a neck with a width of 1 centimeter to a button shape terminal of 1.5 to 2 centimeters in diameter. When the bowel is brought through the incision, an opening is provided through the mesentery by suitable suturing where the gut is kinked or bent. Through this

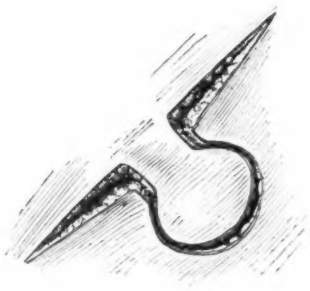


Fig 1. Primary incision.

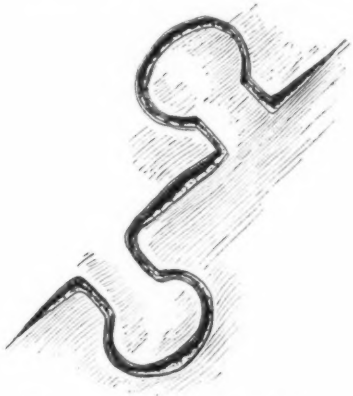


Fig. 2 Cross tenoning long incisions.

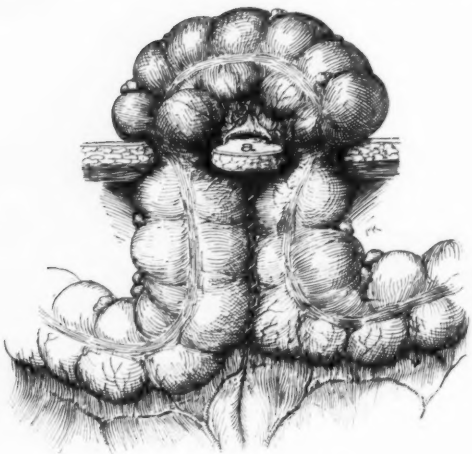


Fig. 3. Lateral view through.

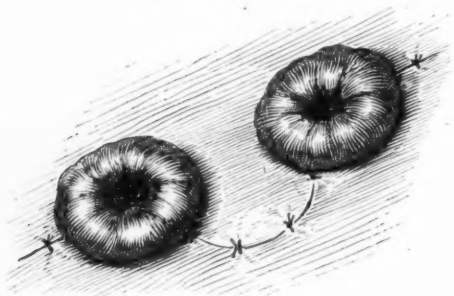


Fig. 5. Operation complete showing distal and proximal ends.

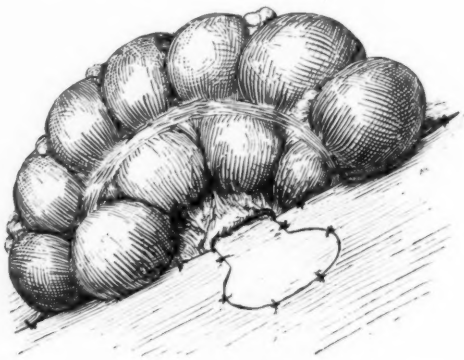


Fig. 4. Operation complete before bowel amputation.

opening the skin extension is protruded, so that the bowel in its permanent attachment, is sutured to the skin margin, around its entire circumference. In closing the wound the button is sutured back in its original position, as in a skin plant of full thickness.

When the bowel is cut across at the time of operation, or subsequently, a distinct skin separation results between the two open segments of the cut intestine, and no possible sagging back into the abdomen can result, thus producing a much more effective result.

The use of a rod support for the bowel at the time of operation is not needed as this graft acts as a support.

The diagrams which are presented I believe fully illustrate the steps in the technique which I have described.

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD MARCH 19, 1920. DR. ARTHUR H. CURTIS, PRESIDING

TWO CASES OF TRUE KNOT OF THE UMBILICAL CORD

DR. C. HENRY DAVIS, Milwaukee, Wisconsin: I wish to exhibit two specimens of true knot of the cord, recently obtained at Columbia Hospital, Milwaukee.

The first is the placenta from a VI-para, whom I delivered November 17, 1919. She had a moderate hydramnios and a very active baby. Fortunately in this case the baby, an 8 pound, 12 ounce girl, was delivered just 10 minutes after I ruptured the membranes. The cord which was once around the neck evidently pulled the knot tight when the head descended to the perineum. After delivering the head the portion of the cord around the neck was found to be distended but not pulsating. The portion next the child was found collapsed on delivery. The child was born in an asphyxiated condition but was resuscitated with little difficulty.

The second specimen was obtained 3 days ago by my colleague, Dr. Copeland. The patient, a multipara, stated that the baby had been very active at the beginning of labor but that a little later no movements were felt. Shortly after the patient went into labor she began to bleed. On admission to the hospital Dr. Copeland diagnosed a premature separation of the placenta. He dilated the cervix manually and delivered a still-born fœtus. The cord was found to have a true knot, drawn tight, with the placental portion distended and the fœtal collapsed.

INCLINED HIP REST

I wish to report the use of an inclined hip rest in the delivery of obstetrical patients. For a number of years I delivered many of my patients on the flat douche-pan. Later a rectangular basin was placed under the hips after the final cleansing. Some months ago it occurred to me that by using an inclined hip rest it would be possible to secure not only the benefits of having the patient elevated from the delivery bed, but also the relaxation of the perineum which comes from the Walcher position. Accordingly I had made an inclined hip rest with the dimensions of 18 inches long, 16 inches wide, and 5 inches high, including pad at the high end. This hip rest is placed under the patient just before draping the sterile sheet. The sheet is draped over the legs and down between, far enough to expose the vagina but above the anus. Fæcal material, lochia which has passed over the anus, etc., goes on to the bed under the sheet and the field does not become contaminated as with the usual plan of using leggings and the sheet under the hips.

This hip rest may be used for forceps or breech deliveries. Thus far I have had occasion to do two mid-forceps and one outlet forceps deliveries without any shifting of the patients. This means not only a saving of linen but also of time, which is an important factor in some cases. In my work this hip rest is such a useful device, I wish to recommend its trial. It can be used on any delivery bed.

DR. FRANKENTHAL: What was the condition of the second baby when it was born? I think you said it was dead.

DR. DAVIS: There was no maceration as it died during labor from the true knot or the premature separation of the placenta.

REPORT OF A CASE OF RUPTURED ECTOPIC SINGLE OVUM TWIN PREGNANCY

DR. WILLIAM C. DANFORTH: I wish to show a case that occurred recently—a ruptured, ectopic, single ovum, twin pregnancy. One fœtus is shown in the sac, and the other is lying loose in the bottom of the basin. The patient was a woman, 35 years of age, who had had one pregnancy 9 years ago. Subsequently she had had no pregnancies.

While visiting in Chicago she began to have abdominal pain after having missed one period. At the time she was first seen there was nothing suggestive of ectopic pregnancy. She was watched by Dr. Vruwink for some days. After the clinical picture became clearer, the woman was brought to the hospital, was operated upon, and we found an ampullar ectopic pregnancy which ruptured, giving the clot shown in the specimen which, on section, shows a single egg twin pregnancy, one fœtus being in position. The other fœtus became detached and is floating about at the bottom of the pan. The opposite tube was very much enlarged, with the fimbriated end closed and was excised.

REPORT OF SMALL ECTOPIC PREGNANCY

DR. N. SPROAT HEANEY: This patient came to see me rather recently on account of sterility. Her last pregnancy was 7 years ago. I found nothing on gross palpation to account for her sterility. On February 20, the expected date of her menstruation,

she began to menstruate, but it was not so profuse as usual, and instead of the menstrual period disappearing it continued. She bled some every day until yesterday when I operated upon her. It was only the day before I operated upon her that I felt I could detect something in the region of the right appendages. She had no cramps, no "gas pains," or other discomfort which might be taken as an index of a distention of the tube. I explained to her I was not absolutely sure that she had ectopic pregnancy, but felt it was reasonably certain on account of the continued bleeding, and that it would be well to do a curettement, when I would make an exploratory colpotomy and see what we would find.

Upon opening the cul-de-sac several drops of blood exuded. I delivered the uterus into the vagina hoping I might complete the operation vaginally. The tube, however, was held up by adhesions, and I could not bring it far enough into view to ascertain whether pregnancy existed or not; but the blood in the cul-de-sac was so convincing that I opened the abdomen and found this small ectopic pregnancy—.5 millimeter in diameter—of the right tube.

The particular points are that the patient had ectopic pregnancy and no pain, that pain is not a necessary symptom in the diagnosis of ectopic pregnancy, and that irregular and continued bleeding are signs of the greatest importance in the consideration of ectopic pregnancy

DR. HEANEY: In a second case in which the unruptured ectopic sac is 1 centimeter in diameter, the patient had exactly the same history except she had bled only for a week. Here I opened the cul-de-sac and removed the ectopic pregnancy through the vagina.

DR. CHARLES E. PADDOCK: I have no criticism to make regarding these cases reported by Dr. Heaney, but inasmuch as Dr. Heaney made the diagnosis of ectopic pregnancy once before, it is all right. I think really it is a wonderful diagnosis. If I understood him correctly, he said there was bleeding at the time posteriorly. I would like to know how long that bleeding had occurred until there was any accumulation in the cul-de-sac. If there was bleeding at the time you opened, why was not there an accumulation of blood at that time?

DR HEANEY: In both of these cases I wondered afterward, if I had not found blood in the cul-de-sac, how far I would have gone in the exploration. In the older case, I do not think there were over 10 minims of blood in the cul-de-sac. In this case there was not more than a tablespoonful. It could not be palpated, it was not coagulated. In the second case, I may have been mistaken, but I thought I palpated the swelling of the right tube; the patient was very thin.

PHYSIOLOGY OF OVULATION

DR. S. S. SCHOCHET read a paper (by invitation) entitled, "The Physiology of Ovulation." (See p. 148.)

DISCUSSION

DR. CAREY CULBERTSON: Dr. Schochet's work presents an extremely interesting phase of ovarian physiology and the society is fortunate in having the subject presented at this time. It brings up one or two other interesting points concerning which I should like to ask a couple of questions.

The first is in connection with the nature of the ovarian hormone and its relation to the liquor folliculi —whether there is one or whether there are two or three separate ovarian secretions as has been suggested by various writers on this subject is not so important. If, however, as some investigators think, the hormone is contained in the liquor folliculi, it is interesting, indeed, to have had the protealizing factor of the liquor folliculi brought out as has been done by Dr. Schochet; it is one step nearer, perhaps, in identifying the nature of the internal secretion of the ovary.

The second point of interest is the possible relation between the results of Dr. Schochet's work and the development of the so-called atresic follicle. He has stated that the granulosa cells toward the edge are digested but not the granulosa cells about the ovary. May it not be that a certain number of cases with liquor folliculi is capable of digesting all of the granulosa cells, those about the ovary as well as those along the edge of the follicle, and that in this way the ovary is destroyed and we have produced what is called an atresic follicle, a cystic degeneration of the ovary, thus explaining the cystic degeneration as a physiological process and not a pathological one?

DR. CHARLES S. BACON: I would like to ask if Dr. Schochet considers that there is any difference in the action of these granulosa cells and the theca cell. I did not quite understand the theory as to why the action should be limited to this cell.

DR. JOSEPH L. BAER: I would like to ask Dr. Schochet to elaborate a little more his reasons for concluding that the transplant of the ovary in the anterior chamber is not mechanical.

DR. N. SPROAT HEANEY: This to me partakes of prestidigitation. I would like to know how Dr. Schochet is going to fertilize these ova that are released in the eye. He spoke about doing this, and I would like to know how he would go about it.

DR. CHARLES S. BACON: Is there any difference in the reaction of the enzyme to the granulosa cell and the theca cells?

DR. SCHOCHET (closing the discussion): In answer to Dr. Culbertson, as you well know, the study of enzymes and ferments is very difficult, and our knowledge on the subject of ferments is limited. I have searched through all the German works, especially that by Abderhalden, who has opened up that field of protective ferments of the body caused by foreign proteins to the organism. As to the origin of erepsin found in the graafian follicle, I can not say definitely where it is formed.

I had the good fortune at the time of working on this problem to have the valuable assistance of

Prof. Gustav Mann, exchange professor from Edinburgh. He gave me many helpful suggestions in the study of the chemistry of the various proteins found in the liquor. The enzyme present which I have been able definitely to prove corresponds to the enzyme which is found in all tissues of the body, namely, erepsin. There are certain tests which indicate that the protein molecule is broken up by other enzymes than erepsin; it is indicated by certain end products of protein digestion. These are the other enzymes I have alluded to in a hazy way. It requires further study along these lines before I can speak definitely of the other enzymes.

As to the presence of hormones I cannot answer.

In answer to Dr. Bacon's question, the only thing I have been able to find is that there is a difference between the cells of the stratum granulosum and the theca cells. If one injects methyl blue into a normal rat, one find that the cells of the stratum granulosum take up the stain and other cells do not, a selective action of certain cells in the body for stains of the azo-group. It indicates that there is a necrosis of cells or some change which permits these cells to unite chemically with the protein molecule.

In answer to Dr. Baer's question, in order to have a scientific paper we must rule out any error that is a possible factor in the problem. When transplanting any tissues a certain number of cells undergo necrobiosis, which may permit a certain number of ova to rupture, and such ova would not be normal ova. It must be proved that these ova are physiological before the problem is definitely settled.

In answer to Dr. Heaney, as to fertilization I can only answer that by saying I have met with a number of difficulties but have succeeded in transplanting pieces of ovary in the anterior chamber of the eye. One must ascertain the time when the ova are going to be expelled from the ovary. Ovulation takes place from 24 to 36 hours after parturition, or 30 days thereafter. I have transplanted a number of pieces of ovary into the anterior chamber of different animals, and will allow the rats to become fertilized in the normal way, and after parturition will attempt to fertilize the ova by injecting spermatozoa in normal salt into the anterior chamber of the eye.

OBSERVATIONS ON THE TECHNIQUE OF RADIUMTHERAPY IN DEEP-SEATED CANCERS; ESTIMATION OF ITS CURATIVE EFFICACY

DR. HENRY SCHMITZ read a paper on the technique of radiumtherapy in deep-seated cancers. (See p. 177.)

DISCUSSION

DR. CHARLES S. BACON: I would like to ask Dr. Schmitz to elaborate a little more in his closing remarks on the technique he uses. In case a patient is bleeding profusely, I understand the radium is applied without any efforts to stop the bleeding. Is that correct?

DR. N. SPROAT HEANEY: I should like to ask Dr. Schmitz what his explanation is for the rapidity of exitus after operation preceding radium. Why is it so much quicker than when radium alone is given? For instance, when a patient has massive carcinoma of the cervix, if we excochleate and put in radium at the same time, why does that add to the danger of the patient? I know the answer that is given by a great many men, but it has never seemed logical to me. It would seem that if radium has the power of penetration with the rapidity that these rays are supposed to have, if we excochleate and put in radium, the rays would pick up the carcinoma cells that are released into the lymph stream.

DR. MARK GOLDSTINE: One of the difficult things that comes up in the treatment of carcinoma of the cervix with radium and with operation is that one cannot tell whether he has metastatic glands to deal with or not. In some of the earlier cases of carcinoma of the cervix, which look very favorable for radium treatment alone, we find metastases of the deep pelvic glands. In some of the advanced cases of carcinoma of the cervix, where panhysterectomy is done, followed by the Ries method of cleaning out the parametrium and deep pelvic glands, we do not find glands that contain carcinoma, while in the early carcinoma of the cervix, in doing the Ries operation we run into one or more glands that contain carcinoma cells. An early carcinoma of the cervix, which is regarded as a good case for radium treatment, might have these metastatic glands. If that is the case, radium will do no good. In advanced cases of carcinoma of the cervix radium will not do much good.

I would like to ask Dr. Schmitz how long, after using radium, does he wait before doing panhysterectomy? If you wait too long after radiation, it is exceedingly difficult to do panhysterectomy on account of the deep scar tissue in the pelvis.

With reference to screening out the β-ray, can you screen out all of the β-rays so that none of the secondary rays go through?

Personally, I would not want to trust a frank operative case of carcinoma of the cervix to radium treatment alone, owing to the possible involvement of the glands.

DR. N. SPROAT HEANEY: I noticed that Dr. Schmitz in his routine treatment applies the radium on 7 successive days, if I understood him rightly. I wonder if the trauma of putting radium into the cervical canal 7 times would not be comparable to the amount of trauma inflicted by an excochleation.

I can see an advantage in extensive carcinoma in changing the radium in order to radiate a different area, but Dr. Schmitz gives the reason that the tissue has a chance to recover itself from the former radiation. I think it would be hard to establish as a fact that tissue can recover in 24 hours from radiation.

DR. ARTHUR H. CURTIS: Our experience has been similar to that of Dr. Schmitz' in advanced cases of carcinoma. Aside from stopping bleeding and

making the discharge less, the use of radium in hopeless carcinoma is decidedly contra-indicated. These patients suffer a good deal from inflammatory reaction after radium. We have found that the retention of fluid or inflammatory exudate is oftentimes due to a purely mechanical proposition. Occasionally the patients who come back after 2 or 3 weeks are found to have absolute stenosis of the cervix. Instead of leaving drains in for 3 or 4 weeks, it has been our practice to use a small cervical dilator when there is distress, or when the flow of inflammatory exudate is not satisfactorily free.

Dr. William C. Danforth: In the recent reports on radiotherapeutic activity, some authors have been using some form of adjuvant, chemotherapy. I have noticed particularly in a report from the recent congress of French speaking gynecologists, held in Brussels in the fall, that one man speaks of using what he terms euzytol. A report of this same thing appeared in the work of two or three other men, and the object of it is to hasten absorption of the protein and make it possible to work with smaller doses.

Dr. Rudolph W. Holmes: Those who present contributions on cancer and its treatment usually manifest two fallacies in their deductions. Longevity is determined from the date of operation to death. How long does a woman live after the first suspicious sign of cancer has developed? The second fallacy is that no determination of malignancy is attempted. The fact is that there is no gauge of cancer malignancy other than the rapidity of its course; an inspection of cellular elements, or consideration of isolated signs or symptoms offer slight aid in this connection. As far as I can determine, the chief factor in the determination of malignancy lies in the metastases into neighboring lymphatics—and this only too often may merely be suspected, and not definitely known at the time of operation. If there be no involvement of the lymphatics a timely operation may mean no recurrence; in such instances of limited involvement possibly radium may be conducive of a cure, but where encroachment onto distant structures has occurred, probably, we see those whose life expectancy after active treatment has not been prolonged.

Some years ago I had a woman who absolutely refused consideration of any treatment. She went over 2 years with really perfect comfort, only to die of pneumonia at an early period of discomfort from the growth of her cancer. Dr. Curtis will probably remember my friend, 2 or 3 years ago, who came to me in the month of August. Examination merely showed a slight hardening of the cervix posteriorly. She had had merely a trivial leucorrhœa for some days which had distressed her. Cancer was suspected and she was advised to have an immediate hysterectomy. She refused every suggestion for treatment. A month later she had an extensive cauliflower growth, and about 2 or 3 months later she was dead. The first was a relatively benign case, the second a true malignancy. The first might have been freed of her trouble by timely intervention, the second would not have derived a benefit.

We still are groping in the dark as regards treatment of cancer. Cancer still kills in the same proportion as it always has. I doubt that cancer is on the increase. The early recognition of cancer has enormously increased, and more exact interpretation. As I see it there is no real curative treatment for cancer at the present time, and there will be none until the cause of the disease is made known.

Dr. Joseph L. Baer: I would like to ask Dr. Schmitz under what circumstances, if any, he uses deep X-ray as an adjuvant to the radium application.

Dr. Schmitz (closing the discussion): Answering the first question, How are we able to arrest profuse bleeding while using radium? We do not pay any attention to the bleeding. The cervical canal is dilated no matter how much the organ bleeds. This can be done readily and safely. The radium capsule is inserted and the vagina packed, which usually arrests the bleeding. In exceptional cases it may be necessary to use some hæmostatic. Then we employ tincture of chlorid of iron, saturating the gauze thoroughly with it and packing it against the cervix. Cases may bleed for 2 or 3 days, after which time bleeding usually ceases due to the action of the radium.

Regarding the question of the rapid excitus following operation after local arrest of the cancer, we can best answer this by briefly reciting the histories of two patients: A woman, 30 years of age, had a carcinoma in the posterior cervical lip which extended along the uterosacral ligaments to the anterior rectal wall. The patient was treated with radium, resulting in an apparent recovery. A year afterward she returned complaining of pain which radiated along the side of the rectum. A careful examination did not disclose any recurrence, but she had hæmorrhoids. We cauterized the hæmorrhoids, and after 2 or 3 months she returned complaining of the same pain. I decided to cut out a piece of the posterior cervical lip, the seat of the primary cancer. Microscopic examination revealed a degenerated carcinoma. I am sorry I have not the slide with me, but the section contained carcinoma cells in all stages of degeneration intermingled with connective tissue. The incision was made in March. Within 2 weeks the woman had a very rapidly growing recurrence which was absolutely refractory to the radium rays. Evidently the trauma caused a rapid regeneration of the dormant cancer cells. The patient succumbed to a general carcinomatosis in June. That is exactly what occurs in the hysterectomies for cancer after apparent recovery. Though the cancer cells are dormant, it is possible that they resume their former activity when traumatized.

Another patient died suddenly from heart block 4 months after an apparent cure by radiumtherapy. We made a postmortem and removed the entire pelvic organs. The tissues were cut into blocks and

many sections were made and stained. We spent 2 months in making sections of the pelvic contents, and not a single section was found that did not contain cancer cells. However, all the cells were degenerated, separated in small areolas surrounded by dense masses of connective tissue.

I believe these two instances explain the reason why we should not operate after we have arrested the cancer with radium. Such patients fare much better without an unnecessary and dangerous operation.

As to how long a time should elapse in clearly operable cases between the preoperative radium application and the operation, and, if the operation is done late, whether the dense scar tissue interferes with the successful performance of the operation.

The formation of dense scar tissue after radium application is the result of overdosing. If we are careful in gauging the dosage, and do not give more than 3000 to 4000 milligram hours of radium element, we will not have heavy scar tissue formation. When we use 8, 9, and 10 thousand milligram hours of radium element we cause the formation of an enormous amount of scar tissue.

The time interval observed between radium application and operation is usually 8 to 10 days. Should we find a great deal of difficulty in arresting bleeding on account of scar tissue, we clamp the tissue and do not bother about ligating a single vessel. The forceps are left *in situ* for 36 hours when they are loosened one or two notches. Twelve hours afterward, if there is no bleeding, they are removed and two or three silkworm gut sutures, which were placed in the abdominal wall at the time of operation, are tied as soon as the forceps are removed. Drainage is established and maintained through the vagina.

Concerning the screening of the primary and secondary β-rays we are convinced that a brass screen 2 millimeters thick will arrest almost all the primary β-rays, while the rubber filter will absorb the secondary β-rays. Injury might be done to the healthy vaginal mucosa. But if the radium is placed in the uterus, where one and a half centimeters of tissue intervene between the radium and the vaginal wall, all the β-rays become absorbed and cannot do any harm. There is nothing gained by cauterizing the cervical canal. On the contrary, the layer of tissue lying between the radium and the vaginal and bladder mucosa is destroyed and thereby a good deal of protection of the healthy tissue is lost.

The question was asked whether I have had any experience with chemotherapy used in conjunction with radium. I have used almost every substance known and recommended for the treatment of cancer but without observing any apparent benefit. I believe that radium has also secondarily biologic properties. The rays split up cancer cells. The split products are absorbed, giving rise to a formation of protective ferments or substances which very well antagonize progress of the cancer disease. Any substance, be it a chemo-biological substance or a tumor extract, etc., that increases the formation of these protective ferments would be a valuable adjunct in the treatment of cancer.

Whether the trauma, caused by inserting the radium into the cervical canal, is not as injurious as excochleation. I think that a careful dilation can be performed without causing much trauma, and we rarely ever have to dilate the cervical canal again at subsequent radium insertions.

It has been stated that as long as we do not know the average expectancy of life of a patient suffering from carcinoma and not subjected to treatment, it is difficult to determine whether a patient is deriving any temporary benefit from treatment. I believe the expectancy of life has been thoroughly studied in a great number of cases. You will find in Veit's *Handbook of Gynecology* the statement that from the time cervical cancer is recognized the duration of life is 2 years. For corporeal cancer it is about 3 years.

There is no doubt that some cancers react more slowly to radium than others. It is impossible for any one to state from microscopic examination whether a particular tissue is more suitable for the rays than another. Apparently such differences are not due to the histologic character of the cancer. Maybe the natural defensive power is greater in one patient than in another thus causing a difference in the reaction. Probably it is due to metabolic or similar disturbances.

Massive X-rays have been found to be a desirable and valuable adjunct to radiumtherapy. We have observed a great number of patients treated with the X-ray, especially breast cases. The X-ray undoubtedly has a great influence on cancer tissue.

It is made a rule at our clinic that each patient shall have from 8 to 12 treatments suprapubically and 6 over the sacrum and buttocks. To each one of these fields of 12 to 20 we apply 50 millimeter minutes, the filter being .5 millimeters of aluminum, the focal distance 7 inches, and the spark gap from 8 to 9 inches.

As soon as apparatus are built that can produce 180 to 200 thousand volts of current, and tubes made that will stand such a load, Roentgen treatment will be much more efficacious as the intensity of the rays from such a tube would be as great as that of the γ-rays of radioactive substances.

GORGAS

GENERAL GORGAS, whose life was a continuous service to all, was stricken on Decoration Day and died on Independence Day, 1920. The power and influence of this unassuming gentleman, who was so universally loved, cannot be appreciated without estimating the qualities of his mind and the unusual accomplishments of his life's work. His mind was that of a crusader, with the action of a conventionalist; that of a progressive, with the mildness of a conservative. He possessed an honesty of purpose that caused him to think straight and judge his fellow-men with the greatest charity. He influenced men by this obvious honesty of purpose and his assumption that his adversaries, too, desired the whole truth. His scientific mind was warmed by his loving personality and his practical vision translated the discoveries of science into service for humanity. He was an indefatigable worker and specialized with enthusiasm along selected lines. His unselfish desire to aid endeared him to all men, and his tendency to accept the best in his associates as their real selves made him the particular friend of every man who knew him. Under his mild exterior lay an unsuspected strength which made him slow to change after he had carefully arrived at decisions. And, finally, he had the mind and the vision of a genius that illuminated dark places, that enlarged his horizon, and that gave him confidence to tread in unexplored paths. His honesty, his strength of character, his industry, his originality, his scientific training, his faith in his friends, his charming personality, his willingness to accept responsibility, his love of humanity, and his unusual insight into the meaning of things made him the man at whose bier the whole world is now paying tribute, and whom the coming generations of men will honor and revere.

In his chosen professions—physician, soldier, sanitarian—he accepted responsibilities far beyond the routine service that was required of the conventional worker in those professions, and he brought to bear upon his life's work the unusual characteristics of his being. His independence of thought led his scientific mind to reject the conventional notions of the cause of disease and to advocate new theories and new methods which revolutionized the therapy of ages and created a new medicine, and which, by their application, have rendered to civilization a service through which people will be benefited for all time.

When the crisis of the world-war occurred, this soldier, this scientist, this world-benefactor, when the ordinary man would have welcomed a well-earned rest, found and accepted a new responsibility which had been thrust upon him, and as Surgeon General of the armies of the United States, this resourceful man filled the position in a manner to command the applause of the President, the Secretary of War, Congress, the medical profession, the lay soldier, and the people of the United States. It is doubtful if any other man than General Gorgas, after accepting this assignment and its responsibilities, could have reorganized and conducted the office successfully under the searching and critical scrutiny to which it was subjected due to the disastrous break-down of the same department during the Spanish-American war.

W. C. Gorgas

COURTESY OF THE CHICAGO DAILY NEWS

The magnitude of his success can only be appreciated when one realizes that the Medical Corps, under Surgeon General Gorgas, was built up from a peace-time organization of less than four hundred officers to a war-time expansion at the time of General Gorgas' retirement of more than thirty thousand officers and two hundred thousand enlisted men—a Corps far in excess in numbers and responsibility of any other three Corps in the United States Army.

During the latter years of General Gorgas' life, in his official capacity, he was frequently called upon to give information and advice to his superior officers and the military committees of Congress. Here this man accomplished some of his most important work. No witness received closer attention than did he, and no words were more implicitly believed or carried greater weight before the Congressional Committees than those spoken by General Gorgas. In the early days of the war, it was his frank testimony before the House Committee on Military Affairs that established his reputation for honesty and that turned the tide of destructive criticism which had been launched against the Medical Corps for its treatment of the soldiers in some of the partially constructed southern camps. "Yes," he admitted, "we have, under the pressure of emergency and due to inexperience in handling large numbers of men, made mistakes; but," he confidently added, "we will promise not to make the same mistakes a second time." This frank acknowledgment of error on the part of his own Corps fairly took the breath of the experienced statesmen, and forthwith General Gorgas' prestige was established in Congress, and, incidentally, he had cleared up an embarrassing situation for the Administration.

One could multiply instances like those portrayed in the foregoing in which General Gorgas, going quietly about the routine of his work, aided in unraveling difficulties that in the light of his experienced mind simply required a statement of facts.

In contemplating the life of this man, the outstanding feature is his universal reputation; and the basis of that fame is his work in establishing the sanitation of the world on an enduring principle. This is the great picture of his life's work: painted on a canvas of a great personality and framed in traits of character of fascinating charm.

Franklin H. Martin

BIOGRAPHICAL

GENERAL Gorgas has been affectionately called "physician to the world," by reason of the immense benefits his labors have conferred upon mankind, according to the *New York Times*. His birthplace was Mobile, Ala., a state of which his maternal grandfather, Quayle, had been Governor. He was born in 1854, the son of William Gorgas, a West Point graduate who fought for the Confederacy as a Brigadier General and after the war became President of the University of the South, at Sewanee, Tenn.

It was at this institution that the great sanitarian received his college education before coming North in the seventies to study medicine in New York at Bellevue

Medical College. Following his course in the hospital there he at once applied for a doctor's commission in the Army and was sent to Fort Brown, Texas, as a Lieutenant. Out there Fate, possibly with a purpose, visited his system with the germs of yellow fever. This early conflict with the disease is said to have awakened his interest in it, and thus led to the eventual practical elimination, by his efforts, of this dreaded malady from the list of tropical plagues.

It was during the Spanish-American war and the years following that Gorgas performed the work that first brought him general attention, revealing his remarkable talent as an executive sanitarian. He accompanied the army in the Santiago expedition and then was put in charge of the yellow fever wards of Las Animas Hospital in Havana. While serving as health officer of the city, he seized upon the contemporary discovery of the mosquito transmission of yellow fever and adapted to it his campaign that effectively "cleaned up" the Cuban capital.

Thus he became the unquestioned choice of the Government in 1905 when it became necessary to make healthful the area surrounding what is now the Panama Canal. The French canal builders were twice defeated by seemingly ineradicable tropic disease, and to Gorgas is now given the credit for removing from the Isthmus the twin scourges of malaria and yellow fever, and making possible the engineering achievements of General Goethals.

The fevers and agues which destroyed the workers under de Lesseps disappeared before the careful, scientific methods so efficiently and tactfully put into force by the American expert. Colonel Roosevelt said that he made Panama "as safe as a health resort," and in connection with this successful proof that the tropics can be made a place where white men may live and labor it is interesting to recall these words written afterward by Gorgas himself—they reveal a dream of his:

"I dare to predict that after a lapse of a period, let us say equal to that which now separates the year 1909 from that of the Norman Conquest of England, localities in the tropics will be the centers of as powerful and as cultured a white civilization as any that exist in the Temperate Zone."

In the work of making the Isthmus healthful there were no bands playing or flags flying; fumigation and ash cans were prominent in their place. Off the beaten paths of the zone, and at the headquarters of every little stream was placed one of those humble objects whose rattling has waked us of a morning—an ash can. A lampwick protruded from a hole near the bottom and drop by drop the larvacide, composed of crude carbolic acid, resin and caustic soda, would fall on the surface of the water and be carried away to the destruction of the mosquito larvæ which had to rise to the surface to breathe. These ash cans were called the outposts of the sanitation army.

Five years of the scientific care and thoroughness thus applied reduced the yellow fever death rate of the Isthmus from 8,000 to just nineteen. No wonder that Colonel Gorgas was emboldened to prophesy that some day "a case of yellow fever will be regarded as a medical curiosity."

In 1913 Colonel Gorgas went to South Africa at the request of the British Government to investigate conditions in the Rand mines, where thousands of Kaffirs were dying from epidemics of pneumonia. In 1914, having served in Panama as a Colonel and Assistant Surgeon General, he was promoted to Surgeon General, and the following March he was made a Major General. In 1915, also, he became a permanent Director of the International Health Board of the Rockefeller Foundation, and his last great work in the tropics was accomplished under the auspices of that body. This was his campaign against yellow fever's last stronghold, Guayaquil in Ecuador. He returned from that trip last October after a complete success.

In the recent war, General Gorgas, as Surgeon General of the United States Army, reduced the rate of mortality for our army to six-tenths of 1 per cent. This is a lower rate than that of the Japanese Army, which had previously been cited as the model of hygiene in all military history. Incidentally, the General took issue with the War Department in the movement for raising the rank given to distinguished medical men who enter the service in wartime from civil life. He was strongly in favor of according them positions in keeping with their high professional attainments.

Among the many honors conferred upon General Gorgas may be mentioned the gold medal of the American Museum of Safety, the Mary Kingsley Medal from the Liverpool School of Tropical Medicine, the Presidency of the American Medical Association in 1908, an Honorary Fellowship in the American College of Surgeons, and the Knight Commandership of the Order of St. Michael and St. George. He was a member of several other medical organizations and a United States delegate to the first Pan-American Medical Congress in Santiago, Chile, in 1908.

ARCHIVES OF SURGERY

THE first number of this long anticipated addition to the literature of surgery is before us. The editorial announcement which appears on the initial page, signed by its senior editor, is herewith reproduced:

For a number of years the trustees of the American Medical Association have purposed the establishment of an *Archives of Surgery* similar in character and scope to the *Archives of Internal Medicine*, the *American Journal of Diseases of Children*, the *Archives of Neurology and Psychiatry*, and other comparable publications. Delays of various kinds have arisen, among others those resulting from the war, which have prevented the fulfillment of this purpose. The fact, too, that there were already in this country two great journals of surgery, the *Annals of Surgery* and SURGERY, GYNECOLOGY AND OBSTETRICS, has made this delay of less consequence.

The *Journal of the American Medical Association* has the largest circulation of any medical journal in the world, and represents the activities of the American medical profession. The *Journal*, therefore, must carry contributions which will cover all the different fields of medicine. Contributions to its surgical section are so numerous as to make it difficult to publish them all in the *Journal*, especially since many of these contributions are too technical to be of interest to the entire profession.

The trustees in establishing the *Archives of Surgery* have wisely determined that it shall not enter into competition with the journals of surgery now in existence. They believe that it should, besides lessening the burden of the *Journal's* publication, establish a sphere of its own. They believe, and again rightly, that another journal of clinical surgery is not warranted, and the task of the editor, Dr. Dean Lewis, and of the editorial board is to develop an organ which will in no way interfere with the justly earned successes of the existing publications, and yet establish a journal which will be creditable to the great organization that it represents, and sufficiently useful to the profession to warrant its entering the field.

In the growing period of surgery, it was not possible to train surgeons in the true sense. Only a few men had the opportunity to work as assistants to experienced surgeons. This is no longer the case. In the future, the surgeon will serve an apprenticeship; and three-year courses of instruction in which such training can be given are now being offered for those graduates in medicine who have served their hospital internship. It is the hope of the editorial board that the *Archives of Surgery* may be one of the organs of expression in this growing field of surgical education, and that it may furnish an opportunity for the publication of original articles pertaining to research and investigation in those subjects which lay the foundation for sound surgical progress. American surgery has developed unevenly. Many competent observers are of the opinion that clinical and operative surgery and surgical technique have advanced faster than the growth of knowledge with regard to the fundamental but less attractive branches would warrant. It may be said that the philosophy of surgery has lagged, and operations based on unsupported opinions as to their wisdom or their necessity are too frequently advocated.

The *Archives of Surgery* will attempt at least to enlarge the surgical horizon and assist in establishing surgery on a sounder basis. Unpleasant as it may be, the editor will not hesitate to comment editorially on the papers published in its columns in order that both sides of a moot question may be considered. The reader will be given an opportunity to peruse surgical fads and fancies if such be presented, but if the subject matter introduces questionable material it will not be allowed to go unchallenged.

I wish, at this time, to express my indebtedness to the *Annals of Surgery* and to SURGERY, GYNECOLOGY AND OBSTETRICS, and especially to their distinguished editors. The scientific pages of the *Annals* have ever been to me a source of surgical wisdom and inspiration. SURGERY, GYNECOLOGY AND OBSTETRICS, combined with its abstract department, is one of the most extraordinary achievements in the history of surgery. Its editor, by his vision, knowledge and courage, has placed the surgical profession in his debt. WILLIAM J. MAYO.

There are four points in this editorial, announcing the policy of the American Medical Association in undertaking this new publication, which particularly commend them-

selves to the editor of SURGERY, GYNECOLOGY AND OBSTETRICS, the official journal of the American College of Surgeons: First, its broad idealism defined in the fourth paragraph of the editorial in reference to the growth of surgery in which it is stated, "It is the hope of the editorial board that the *Archives of Surgery* may be the organ of expression in this growing field of surgical education"; second, "that it may furnish an opportunity for the publication of original articles pertaining to research and investigation in those subjects which lay the foundation for sound surgical progress"; third, that the new publication may assist in overcoming the unevenness of surgical progress; and, fourth, that it will seek to advance the knowledge of the fundamentals and philosophy of surgery until they will balance with the clinical and technical.

The editor, after enumerating these ideals, adds that "the *Archives of Surgery* will attempt at least to enlarge the surgical horizon and assist in establishing surgery on a sounder basis."

With these ideals, with an editorial board of young, practical surgeons, with an active editor of international reputation as a surgeon and teacher, and with the backing of a great association of unlimited financial resources, the new candidate for surgical honors, with its dignified appearance and filled with material from the pens of influential surgeons of our country, should aid in maintaining the prestige of the surgical publications of America.

SOUTH AMERICAN SURGEONS

A Trip in Behalf of the American College of Surgeons by Dr. William J. Mayo, President, and Dr. Franklin H. Martin, Secretary-General—Concluded

By FRANKLIN H. MARTIN, M.D., F.A.C.S.

I. WHEN SHOULD ONE VISIT SOUTH AMERICA?

WHEN should a resident of the United States make a vacation trip to South America? This will depend upon the object of the journey and the tastes of the traveler, as well as his desire to recreate in á new world. The full thrill of a visit to South America, from a climatic standpoint, can be obtained by leaving New York in January or February, after one has experienced some of the severities of zero weather in our northern states. A most satisfying contrast is apparent between New York weather in those months as compared with that which is prevalent three days afterward in the gulf stream off Florida and the Bahamas, followed by the approach to Jamaica and Panama, with their delightful tropical atmosphere and a summer sea. In January and February the heat in the Caribbean Sea and the Pacific Ocean is not so intense as that which will be found later, when the sun is well back from its excursion to the southern zone. Therefore, the dreaded heat of the Equator is not to be feared in these early months, and when the perpendicular rays of the sun are met, the Humboldt Current of the southern zone cools the sea and fans the atmosphere. And when one reaches Peru, Chile, Argentine, and Uruguay in February and March, while it is the summer of these countries, the atmosphere is much like San Diego or Pasadena during the same months, the temperature varying from sixty-five to eighty-five degrees Fahrenheit, with cool nights, and comfortable days if one is not exposed to the direct rays of the sun. At this time of the year, the society people are residing in the country. But, unlike the custom in our country, the summer homes of these people are in rather close proximity to their winter homes—in the beautiful suburbs and nearby towns or country estates. However, at this season one cannot enjoy the attractive social features of winter life, with the operas, the theaters, the gaieties associated with the season's races, and the general winter life of the people in their city homes. For this reason the society devotee, the seeker of the gaieties of these attractive, cosmopolitan centers, the one wishing to study the people in the making of their laws, in their normal social intercourse, and in their educational institutions should go to South America during their fall, winter, and early spring, or our May, June, July, August, September, October, and November.

The surgeon and physician who desires a vacation and who will be satisfied to visit the hospitals and the medical institutions of South America at a time corresponding to our June, July, and August, will be more than content with the bird's eye view of their institutions, with the novelty of travel, with the external beauty of the different countries, and with the consciousness that he is escaping the severe winter of our northern climate, and enjoying an ideal summer atmosphere in the most fascinating environments.

To summarize: For charm of change from severe winter to most desirable summer, for a long sea voyage without heat or storm, for a view of the continent in its summer garb, for a visit to cities divested of the members of society but with much remaining to interest and please, leave the northern continent in January or February. For a view of the social life and of the society people living a normal and active life in the cities and with disregard of the charm of change in climate, visit South America during their winter, our summer.

II. LOOK AT THE MAP[1]

How few realize that the west coast of South America is on a line with the eastern coast of the United States! A plumb bob dropped from New York would pass to the east of Cuba, through the Panama Canal, and would hang on a perpendicular line in the harbor of Valparaiso. Realize that with one's three weeks' cruise from New York to Valparaiso, directly south, there is not the usual distraction of changing one's watch. Realize that the western coast of the United States is nearly four thousand miles west of the most westerly point of South America and the Panama Canal. Realize that in traveling from San Francisco to Valparaiso or Lima one would change his timepiece one hour on three different occasions, and that the eastern coast of Brazil is fully as much farther east and more nearly approaches the longitude of England than of New York.

[1]See map of South America on page 211.

Realize that the mountain ranges of South America border on the western coast and that many of their highest peaks are observable from the sea. Realize that these mountain ranges are full of the richest minerals and that they have been scarcely scratched by modern mining methods. Realize that a rainless coast and most beautiful valleys are lying below, ready to have the water from the mountains poured onto their soil, which will make them produce and become as beautiful as the reclaimed deserts of California. The prehistoric civilizations of Peru appreciated and utilized these facts and made themselves the envy of the later civilizations that conquered them for their wealth, and who now, after four centuries have passed, are about to imitate their methods, utilizing for the purpose all of the added facilities of modern science.

III. THE MAP OF CHILE

Look at the map of Chile! Do you comprehend the immense possibilities of that narrow country when she carries out the plans which are now under contemplation and when her efficient people work out the dream of her engineers? Billions of tons of gold, silver, copper, and other minerals are buried in that bulwark of mountains on her eastern border. Between the mountain barrier and the Pacific Ocean lies the strip, one hundred and fifty to three hundred miles in width, extending from the tropics on the north to the Temperate Zone and almost the Frigid Zone on the south. The northern half of this country requires water to make its valleys equal the productiveness of Southern California. The mountains near at hand will yield to the machinations of her engineers, and the gold and wealth will pour into her lap. The country requires power for manufacturing, fuel for lighting, and in the southern portion facilities for heating. Her engineers have only to tap the nearby, never exhaustible supply of water from the mountains to get an abundance of power, light, and heat, and that with the utmost economy. And this is what they are doing. We shall have to watch and wait but a short time until these Yankees of the southern continent will win our admiration and applause through their accomplishment of greater wonders than those already recorded.

Speaking of Chileans as the Yankees of South America, the Chileans, with their generous sense of humor, are already facetiously reversing the compliment by calling our complacent people the Chileans of North America.

Then look at the countries to the east of that great spinal column of the continent. Travel on a broad gauge train of sleepers from the Andes to the metropolis of South America, and watch for thirty-six hours a duplication of the rich plains of Nebraska, Kansas, and the Dakotas; study the map and trace the net-work of great water courses which find their origin in that same great spinal column, and which follow their courses for thousands of miles through Brazil, Paraguay, Uruguay, Colombia, and Venezuela. Can any one begin to appreciate the possibilities of that vast area? The dread of disease and pestilence of the tropics has been forever removed by a self-sacrificing group of scientists of our own medical profession, led by our honored Gorgas. Even now this organization is about its business there, working while there is yet time. With sanitary regulations properly enforced, think of the wealth of the Amazon Valley!

IV. LIMA, PERU

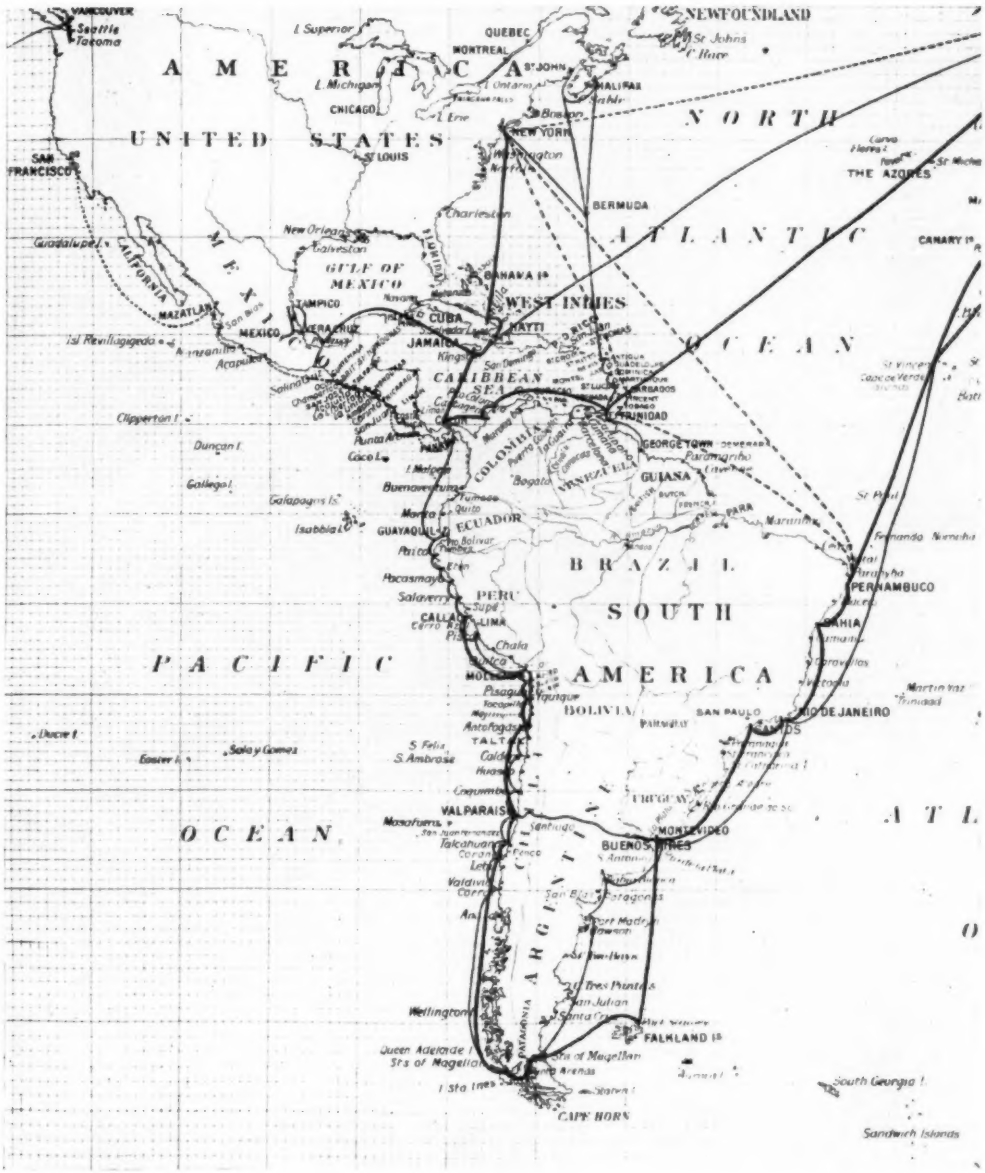
In conversing with my friends about the countries visited by us, they ask a number of questions about concrete facts regarding South America. I shall endeavor to summarize answers which, in a very imperfect manner, will reply to some of these interrogations—facts that I would have been pleased to have had fixed in my mind before making the recent trip. In furnishing this information, naturally I must draw upon material laboriously worked out by others, especially articles pertaining to South America published by the Pan-American Union, Washington, D. C.

First let me advise the amateur traveler to prepare his mind for a sympathetic reception of South American travel by reading the romantic history of Peru, Prescott's "Conquest of Peru," because it will furnish the atmosphere through which one should approach this interesting continent. William A. Reid of the staff of the Pan-American Union was saturated with this atmosphere when he began his description of Lima with the following:

> "In awful pride, enthroned above the skies,
> Peaks upon peaks in matchless grandeur rise
> 'Mid frowning glaciers, on whose snowy crest
> The savage vulture builds its craggy nest."

Written long ago, the thoughts of the poet lose none of their charm by the passing of the years. The majestic mountains, the clearest of skies, the dormant wealth, the romance, the locked mysteries of the ages, all abound in the land of Peru. They awe, charm, and inspire us today as they did Pizarro and his little band on that fateful journey up the mountains to meet the Inca chieftain at Cajamarca. Indeed, Peru appeals to the present-day visitor as potently perhaps as did the ruined Andean cities mystify the Incas when the latter race first roamed amid the fastnesses of the great mountains.

Interesting it would undoubtedly be if we could turn back the pages of the centuries and see the builders labor-


NEWFOUNDLAND
St. Johns
QUEBEC
MONTREAL
ST. JOHN
HALIFAX
CHICAGO
NEW YORK
BOSTON
ST. LOUIS
SAN FRANCISCO
THE AZORES
BERMUDA
CANARY Is.
NORTH
ATLANTIC
OCEAN
UNITED STATES
AMERICA
GULF OF MEXICO
BAHAMA Is.
WEST INDIES
CUBA
HAYTI
JAMAICA
CARIBBEAN SEA
TAMPICO
MEXICO
MAZATLAN
CALIFORNIA
MEXICO
TRINIDAD
GEORGE TOWN
GUIANA
COLOMBIA
VENEZUELA
Bogota
ECUADOR
GUAYAQUIL
Quito
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LIMA
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CAPE HORN
South Georgia I.
Sandwich Islands

ing at Cuzco, at Pachacamac, at Chan-Chan, on Titicaca's isles, all within the present bounds of Peru. But pre-Inca life is a silent chapter and we walk through the streets of their crumbling cities mystified at ancient accomplishment. The Incas, who knew nothing of the people who had preceded them, had been living in Peru for 500 years before the appearance of Pizarro in 1531. The former are believed to have numbered five or six million people at the time the "pale faces" arrived on their shores, fulfilling an Inca tradition and fear that some day men with beard on their faces would come from over the seas to take their lands.

Today Peru covers an area equal to Texas, New Mexico, Arizona, Nevada, and Utah combined, or, to be more specific in figures, about 679,600 square miles. This extensive territory comprises three distinct geographical regions—the dry coastal lands, varying in width from 20 to 80 miles; the lofty mountainous section, which in recent years has been crossed by the world's highest railroad; and the vast and little known region lying east of the Andes. The population of the country is about 4,500,000.

Peru is a land of tropical sunshine, and along its 1,500 miles of coastal plain rain rarely falls. Only a few degrees south of the Equator is central Peru, but the northward-flowing sea current and the elevated mountains are responsible for a most delightful climate, the hottest days of summer (December to May) rarely registering a temperature higher than 80° F., or in winter lower than 60° F., in the vicinity of Lima.

The port of Callao is only 8 miles distant from the capital of the Republic. The former has the most modern docking facilities along the west coast of South America (Valparaiso under construction), and many ships tie up at the piers and land passengers and freight directly on terra firma. Callao has about 35,000 population and is a busy, cosmopolitan city.

The City of the Kings, which is now generally known by the modern name of Lima, is located in an undulating valley which extends inland from the ocean for 50 miles or more to the foothills of the Andes, although numerous mountain spurs rise here and there about the valley, two of which, San Cristobal and San Jeronimo, dominate the city of Lima. Through this valley the river Rimac winds its way to the sea at Callao, starting from rivulets at least 17,000 feet high amid the eternal snows of the mountains. Nearly four centuries have passed since Pizarro laid the foundation stones of the cathedral on a central plaza known today as Plaza Mayor. Around and in the vicinity of this level area the new capital began to grow. Pizarro's idea, according to historians, was to found a capital more easily accessible than the cities constructed by the Incas and their predecessors, who builded far inland and in localities difficult to reach. Lima, with its 200,000 population today, has been a long time growing to present proportions. From the early days of 1535 the growing city passed through every phase of romance, struggle, and excitement.

Early in the nineteenth century the growing discontent at Spanish rule became more and more pronounced, the first martyrs to the independence of Peru being Ubaldo and Aguilar. In 1820 the Argentine military leader, San Martin, with his "army of the Andes," and Lord Cochrane in command of a Chilean fleet, came to the aid of Peruvian patriots, with the result that the Spanish forces were defeated and Callao bombarded. On July 9, 1821, Gen. San Martin's army entered Lima in triumph, and on the 28th of the same month the independence of Peru was formally proclaimed. On September 20, 1822, a constitutional congress met in Lima and on the 28th of the following February (1823) the first President of Peru, Don José de la Riva Aguero, was inaugurated; but it was not until after the battle of Ayacucho in 1824 that the royalist troops were completely subdued.

* * * * * * * *

An interesting book could be written about the vicissitudes of the oldest institution of learning in any of the Americas, the famous Universidad de San Marcos. Nearly a century before John Harvard delivered his handful of books in Cambridge to found the first seat of learning in the United States, the professors at San Marcos in Lima had grown old and infirm in educational service. Earthquake and siege have again and again damaged or destroyed the buildings of this institution, but its noble work started in 1551 continues to the present day, although modernized, improved, and enlarged in many ways. Europe's greatest university of ancient days, that of Salamanca, appears to have been the model for the Lima offspring; a royal charter came from Emperor Charles V and his mother, Queen Joana, rooms were secured in the monastery of Santo Domingo, and the work of education in the New World was systematically begun. Today the Universidad de San Marcos maintains schools of law, medicine, literature, theology, and political science; courses which have not only been pursued by many of the best and present leaders of Peruvian life, but by those of other nationalities who are proud to call San Marcos their alma mater.

Lima has naturally developed various other colleges which provide courses in engineering, mining, scientific agriculture, military and naval sciences; also a recently established school of arts and crafts is doing excellent work.

Peru's capital is the home of a national museum, one of the world's most interesting institutions of this nature. It shares with that of Cairo in displaying to modern peoples various incidents of life and activity of by-gone races.

Lima is not only the political but also the commercial capital of Peru, and many of its business streets always present animated scenes. Large exporting and importing houses have their headquarters in the capital, and these industries draw annually an army of business men from other lands. As already observed, Callao may be termed the shipping port of Lima. During a recent normal year more than 1,400 steam and sailing vessels entered this port transporting a vast cargo, much of which was sent farther inland over the railway passing through Lima en route to the mountains. In return, a vast trade in raw products passes through Lima to world markets, among such products being those of the famous Cerro de Pasco mines at Oroya. Lima's cotton, flour, furniture, chocolate, cocaine, boot and shoe, silk, woolen, paper, tanning, and other factories are also contributing extensively to build the trade of the city and suburbs.

In speaking of the climate of southern Peru, this writer reminds us that while this country is near the Equator, the north-west flowing sea current and the elevated mountains furnish a climate in which the hottest days rarely register a temperature higher than eighty degrees Fahrenheit, or lower than sixty degrees Fahrenheit.

Lima, originally an inland city, has, by suburban extension, practically joined hands with the sea-coast city, Callao, and by railroad, tramcars, and motor roads these two cities have become practically one, extending from the blue

The University.

Pacific into the arms of the foot-hills of the Andes forty miles away. For three hundred years this city was the metropolis of the southern continent, and, according to a quotation, it was "the center of vice-regal court whose splendor and gaiety vied with that of royalty itself."

The Universidad de San Marcos has among its several departments a well-conducted, modern college of medicine, with a strong faculty and an equipment equal to the best in any country, and a well-worked-out, seven-year curriculum.

Finally, the writer of the article from which I have purloined so liberally says in his summary, "The City of the Kings has passed and new Lima is now an accomplished fact." He tells us that modernizing influences have been somewhat slow in coming to this secluded country of the western coast; but now, with many of its resources ready for more full development, and with transportation now open through the Panama Canal, a great speeding-up of this country's progress will occur.

V. CHILE

That long ribbon of a country, two thousand five hundred miles long, lying between the Andes and the Pacific Ocean, extending from the tropics through the South Temperate Zone, is full of material for the making of many books. A bird's eye view of the conventional and rapid traveler encompasses certain high lights of interest, and in that alone he can gather food for months of pleasant contemplation. I have already dwelt upon the possibilities of its many undeveloped resources. However, it is in its present condition that we are most interested. The area of Chile is 292,580 square miles, and its population is approximately 3,500,000, which indicates that there are many sections which are

scantily populated. It has two important cities that possess many points of interest to the North American traveler, and several sea-coast towns of growing importance.

Valparaiso occupies a position on the long coast line half way between the upper and the lower limits. It has a population of approximately 200,000. It is a cosmopolitan city, having among its inhabitants 5,000 Germans, 5,000 English, with Belgians, French, Austrians, Australians, and a few from a number of the other Latin-American countries. The United States and Canada are represented by a few hundred, with a sprinkling of Chinese and Japanese.

About 400 years ago, in 1536, Juan de Saavedra, a Spanish officer, founded this settlement, and gave it the name of his birthplace in Spain. It passed through many vicissitudes, including several destructive earthquakes. Like many of the other South American nations, a wave of independence spread over Chile, and the Spanish authorities were deposed in 1810; but it was not until 1818 that the country threw off the Spanish yoke and became a republic. Valparaiso became a flourishing city, but in 1906-7 it met the fate of San Francisco and Kingston. It was partially destroyed by earthquake and fire. It is now rebuilt, and shows practically no signs of its disasters. Valparaiso lies in the southern continent in latitude similar to Buenos Aires, Cape Town, South Africa, and Sidney, Australia. It is directly south of New York, and the distance is 8,460 miles. Valparaiso occupies a flat area around a symmetrical indentation of the sea, a bay nearly three miles in extent of coast line. Beyond the flat area arise steep hills, indented with ravines, and the beautiful city extends from the flat area around the bay onto the hills above, lending to the scene as one approaches the coast from the sea an impression much like that of the bay and city of Naples. The climate of this portion of Chile varies from near freezing in the winter to eighty-five degrees Fahrenheit in the summer.

In a bird's eye view of this Chilean business center, one will be attracted by the steep, inclined tram-car ways, which transport the population from the low town to the hills above; its splendid water supply; the naval academy with its view of the city and bay from its ideal location on the heights; the various well-equipped hospitals which will especially interest the physician; and its suburban resorts, like Viña del Mar, with its water sports and resident attractions.

Valparaiso, while a commercial city of importance, strikes one as an attractive place in which to live. It contains much beauty, its barren hills and its white buildings forming an attractive contrast to the blue waters of its deep harbors, the green of its trees, and the wealth of color of the flowers in its patios and its boulevards.

VI. SANTIAGO

But our time is limited, and we fly away to continue our bird's eye view of the capital city of this republic of the west and south. The great white-capped mountains to the east, which can be seen as we approach, form its eastern boundary. As we wind through fertile valleys and between foot-hills which are its western protection, we find the city itself to be a natural amphitheater of growing produce, of tropical foliage and summer color, a proud metropolis of modern beauty, which, nearly four hundred years ago, before the land of the United States had been traversed by the Puritans or the cavaliers, was founded by the dauntless Pedro de Valdivia with his little band of Spaniards, and which has grown as a testimony to his wisdom. Even then this little valley, eighteen by forty miles, protected by two great mountain ranges with the island mountain, Santa Lucia, in its center, washed by the waters of the Mapocho River, must have been a beautiful spot to look upon. And then began a struggle between a brave band of pioneers and the vicissitudes of a wilderness, with jealous natives to combat—a struggle that has so many times been duplicated in the settlement of the Western Hemisphere, that has tried the souls of men, and, when successful, has developed nations of superior people. The bravest and fiercest tribe of Indians of all the continent had to be subdued in the building up of this settlement, the Araucanians; but the Chileans admire a brave adversary, and now a statue of one of their most resourceful warriors, Caupolican, who was captured and executed by the Spaniards, adorns the plaza on Cerro Santa Lucia.

Allow me to quote from another of the bulletins of the Pan-American Union, written by Edward Albes, one who observed as a stranger the externals of an interesting city. He speaks of a single evening in the Plaza de Armas, in which he observes that the people of Santiago are more distinctly Spanish in sentiment than are those of the cities on the east coast of South America:

> This handsome square, laid out by the founder of the city some 375 years ago as the "Plaza Mayor," is still the center of the city's life during the balmy evenings of the Chilean spring, summer, and fall.
>
> On the four sides of the plaza are several handsome buildings, the most interesting, perhaps, being the cathedral which stands on the west side on the very spot where

the first humble little wooden church ever built in Chile was erected by Valdivia's men. Independent of its handsome architectural features, this religious edifice is of great interest because of the historic and intrinsic value of some of the treasures it contains. Among these may be mentioned the monstrance, altar ornaments, and sanctuary lamp in the chapel of the Holy Sacrament, all of which are of pure, massive silver beautifully carved and wrought and something over 200 years old; a reclining, life-size statue of St. Francis Xavier, carved from the trunk of a great pear tree with remarkable skill, which once belonged to the monastery of the Jesuits, whence it was removed in 1766; a crystal chandelier, once hung in the national library, which lighted the night sessions of the first National Congress of independent Chile; and the grand organ, said to be one of the finest in the Americas, which was acquired through a fortuitous accident.

Immediately adjoining the cathedral is the palace of the Metropolitan Bishop of Santiago, also a handsome structure. On the north side of the plaza are to be found the central post office and the historic buildings of the intendencia and municipal offices. On the south and east sides of the square are the Portal Fernandez Concha and the Portal MacClure, buildings whose lower stories are constructed in the form of arcades in which are numerous retail stores and shops as well as stalls where are to be found potted plants and cut flowers and some of the most delicious fruits grown in the Americas.

In addition to the open squares and plazas, Santiago boasts of three handsome public parks, viz., the Parque Cousino, the Parque Forestal, and the Cerro Santa Lucia. Handsome shade trees, beautiful driveways, beds of gorgeous flowers, fountains, statues, etc., grace the first two mentioned, but other metropolitan cities have similar playgrounds for their people.

But the culmination of the beauty of this unusual city is the island mountain that rises as a dignified landmark and that may be seen from any vantage point. This same writer, in his appreciation of this, says:

Santa Lucia, however, that historic hill once known as "Huelen," is unique. No city of modern time, as far as the writer knows, has anything just like it. It is the culmination of things beautiful and interesting in the Chilean capital, and must needs be seen to be appreciated. No written description can adequately present its artistic beauty, but the following may serve to give the reader some little idea of its charm.

It was Don Benjamin Vicuña MacKenna, one of Santiago's greatest benefactors, who was responsible for the transformation of the rugged mass of projecting basaltic rock, once Valdivia's fort and subsequently for many years used as a sort of potter's field and burying ground for non-Catholics, malefactors, etc., into the delightful pleasure resort of today. The existence of this isolated hill in the center of a smooth and level plain has been something of a puzzle to geologists, for the character of the rock is entirely different from that of the mountains of the region and no other basaltic strata are said to have been found in the immediate vicinity. Whatever may have been its origin, Vicuña MacKenna saw the possibility of transforming the hill into a beauty spot in comparison with which the famed Hanging Gardens of Babylon, built by Nebuchadnezzar for the gratification of his homesick queen, dwindle into insignificance. It is located in the northeastern section of the city, near the head of the famed Avenida de las Delicias, the splendid boulevard that divides the capital into two parts. The ornate and stately entrance, with the broad, graceful sweep of its stairways, its curving terraces, artistic pavilions, domes, and statues is itself one of the most striking architectural features of the city. A broad flight of steps leads from the Alameda to the massive, artistically wrought iron gates on both sides of which stand marble columns surmounted by bronze statues of soldiers in armor holding aloft the electric arc lamps which light the circular esplanade within. In the center of this inclosure is a large basin covered with blooming water lilies, the water being furnished from a fountain whose constantly falling showers on festive occasions are lighted by an electric device beneath, giving an effect of falling drops and sprays of light that is strikingly beautiful.

Leading from the main entrance a circling and gradually ascending carriage driveway skirts along a succession of artistic terraces, stone stairways, rustic bridges, and occasional kiosks, until it stops about halfway to the top in a wide terrace. Here is located a spacious, open pavilion, provided with comfortable seats for loungers and a number of tables and chairs where the visitor may refresh himself with cooling drinks and delicious dishes prepared by the café. During the pleasant evenings an orchestra provides music for the entertainment of the guests and for the benefit of those who care to dance. Not far from this terrace, a little higher up on the hill, stands the handsome mausoleum of Don Benjamin Vicuña MacKenna in which rest the remains of the designer and donor of this exquisite pleasure resort, while just before reaching the terrace on one side of the driveway may be seen a small, heavy, wooden door apparently built into a solid cliff of rock. It leads to a most interesting subterranean chamber—the seismographical observatory of Chile.

From the terrace the summit is reached by beautifully shaded paths which wind gradually upward between dark masses of trees and banks of gorgeous blossoms and flowering shrubs, with here and there cool grottoes and shady nooks provided with benches, along small cliffs from which trickle little streams of water and miniature cascades, side paths sometimes leading to small terraces from which views of the city may be had, until finally the visitor reaches the circular kiosk at the very top. Here, at an elevation of a little less than 400 feet, he secures a panoramic view that is superb. Around the base of this pedestal clusters the city with its spires, steeples, turrets, domes, and towers, its open squares and straight streets, while beyond it to the east and northeast rise the hoary heads of the Andes, perpetually covered with their glistening draperies of snow, sometimes thinly veiled with drifting, diaphanous clouds and again standing out in bold relief against the deep blue of the skies, giant sentinels that seem to stand guard over their loved jewel of the plain. To the west the Cordillera de la Costa bounds the view, its rugged peaks being somewhat lower than the Andean giants, while toward the south the level plain extends as far as the eye can reach, a succession of green fields, regularly laid out farms, and wide meadows on which graze great herds of cattle and droves of horses, a picture of peace and plenty that adds another element to complete the charming panorama.

And so this city, scanned by the hurried traveler, leaves an impression of cleanness, unusual natural beauty, and a serious, efficient people. The natural beauty has been accentuated by art in its boulevards, in its patios, and in its architectural structures. Its people, in the

midst of the picturesque and dignified gifts of nature, have created an efficient government, developed a strong commerce, builded hospitals, libraries, art palaces, and important universities with strong professional colleges, including medicine, law, theology, and engineering.

VII. OVER THE ANDES

Continuing one's flight from the coast across the narrow country, after observing its two principal cities, the foot-hills of the Andes are reached, and the climb of this bulwark of the continent is begun. From Chile to the Argentine, via the Trans-Andean Railroad, is an experience to thrill the most experienced traveler. Again I purloin from another pen, and this time give the viewpoint of a woman by setting down a page from Mrs. Martin's log, written to some friends at home:

Los Andes—Tuesday, February second: General call at 5:00 o'clock; breakfast at 5:30; and train at "6:20, not 6:21." Exactly on time, we started over the narrow gauge road which winds up and through the mountains. For the first hour our way lay via Rio Blanco, and repeated the journey of Monday. I was very glad to have seen it before, as it is not nearly so lovely in the morning as when seen at sunset—a theory I have always maintained as opposed to that supercilious "early bird." However, on this trip there was much of interest, as the people were all flocking to work and in some places thrashing was already in active operation. This is a most primitive procedure. The grain is spread on a hard, earth floor; four or five horses harnessed abreast are driven furiously round and round over it, suddenly stopped, reversed, and the process repeated until the grain is trodden out. It all seems very curious when scarcely a stone's throw away a stream is just tearing its way by and furnishing no end of power. We found later that there had been very warm weather which had melted the mountain snow rapidly and changed placid, indolent streams into raging torrents. That is probably the case here.

Did I tell you about the houses along the way? They, too, are most primitive, sometimes of bamboo with straw roofs, and sometimes mud huts or adobe, but almost universally surrounded by lovely flowers and flowering hedges. Often we saw open-air ovens with some sort of a roof protecting them, and we were uncertain whether they are intended for the family bake or for some process of coke-burning. The coal used by the railways comes in small, uniform blocks, about 4 by 3 by 9 inches, and is made from very fine, soft coal and coal dust; so here, possibly, lies the *raison d'être* for the ovens.

As we climbed into the mountains, they became more and more austere with quite a bit of snow here and there. Soon after leaving Rio Blanco, a cog road is employed which jiggles one slowly along at an almost perpendicular climb. All in all, it was a wonderful morning, with constantly changing peaks coming into view, and an ever new panorama unrolling itself before us. Someway, in our mountains at home one seems to see one particular mountain for a long time, and then another; but here it is just a series of one great mass overtopping its neighbor and stretching on and on indefinitely.

About noon we reached the summit and neared the boundary of Chile and Argentine. Just at this point the train slips into one of the greatest tunnels of the world. It is ten thousand three hundred eighty-four feet long and ten thousand seven hundred seventy-eight feet above sea level. That is "fifteen hundred feet higher than the Stelvio Pass carriage road, and thirty-five hundred feet higher than Mont Cenis, Saint Gothard, and the Simplon Tunnel. When this tunnel was built, the calculations were so exact that at the junction there was only three-quarters of an inch difference in the levels, and the chainage only two and one-fourth inches less than estimated."

At the boundary of Chile and Argentine, a huge and impressive bronze Christus has been erected to symbolize the enduring friendliness of the two countries. It was suggested by Bishop Benavente, cast from the bronze of an old Argentinian cannon, and paid for by money solicited by the women of Argentine, under the leadership of Señora de Costa. It was placed at the highest possible spot in the boundary mountains, and bears the inscription: "Sooner shall these mountains crumble into dust than Argentinians and Chileans break the peace to which they have pledged themselves at the feet of Christ the Redeemer."

From the little station of Las Cuevas we could see nothing of the real statue; but we eagerly strained our eyes toward a dark patch in the snow some three thousand feet above us and drew what satisfaction we could from our distant view. As we came into the Argentine, the character of the mountains seemed to change, and they became more friendly and placid, with gentle slopes and here and there patches of bright yellow flowers.

A few minutes before reaching Puenta del Inca, our train stopped and there in an opening in the mountains towered before us majestic Aconcagua, the highest peak of the Western Hemisphere, six thousand eight hundred fifty-eight meters, or about twenty-two thousand eight hundred feet. Although it was fifteen miles away, its snowy head glittered in the brilliant sunlight, and its silent grandeur touched with awe even the distant observer.

At Puenta del Inca a wonderful natural bridge, medicinal springs, and a good hotel combine to make a popular resort. When the train stopped, I got out and, climbing into a waiting carryall, was whisked away to the nearby hotel. The wisdom of my action was demonstrated when Dr. Mayo and Franklin came puffing up, well winded by the heat and the altitude. At the entrance to the hotel we were greeted with shouts and cheers from the assembled guests, and found the stars and stripes and the blue and white of the Argentine side by side in the decoration of the building. The band played for us and everywhere the greatest enthusiasm and excitement were manifest. The luncheon was excellent, and well served. As usual, there were many courses and a variety of wines. As soon as it was over we were escorted back to our train by the entire community, and wildly bidden God-speed in a chorus of friendly "Adios."

Then began one of the most wonderful experiences of my life as hour after hour the most majestic, multi-colored mountains crept by us. Not a tree, not a shrub, just masses and masses of rock piled on each other, tier upon tier, and of such marvelous color, now pink, now yellow, now deep red, with here and there splashes of green, gray, or blue—all glowing and quivering under the warm afternoon sun.

Whenever the stream, which is now the Mendoza River, was seen—and that was almost constantly, as we followed its bed—the water was tearing along like mad and we began to see traces of the slides and washout which had detained us. At one place we passed the spot where a train, carrying only its crew, left the track and pitched into the water below, where we could still see the cars lying bottom

side up. It is a mystery that this road can ever be kept open at all. Much of the way the track is a mere thread on the side of a mountain whose structure is such that it seems as though the slightest jar might precipitate an avalanche; just loose stones held insecurely together by soft dust and sand; then will come great masses of rock, looking as though only the eternities would dislodge them; and so it goes, constant variation.

Owing to the serious difficulties on the road, our train crept along more and more slowly and we lost more and more time. The sun went down, the moon came up, the mountains loomed dark and threatening and the river tore along alarmingly swift and near. Finally, at about ten o'clock, we neared Cacheuta, which is celebrated for its medicinal baths. By digging only two or three feet below the earth surface, water gushes forth containing various medicinal properties and varying in temperature from seventy-nine to one hundred and twelve degrees. The little town prides itself on its quite pretentious hotel, and as many as twenty thousand guests per annum visit the resort. But here, less than a week ago, occurred a bad slide which carried the road and a portion of the hotel into the river, and at which time several of the guests were drowned. Now, in spite of desperate efforts, the road had not been sufficiently repaired to make it safe for passengers; so we all disembarked, leaving our worldly goods in the cars which were pushed over a rickety bridge, while we followed on foot, single file. It was rather a thrilling sensation to stand out in the open near this little South American town—the stillness of the night, the mountains all about us, the Southern Cross shining over our heads, the moonlight falling on the glistening snow of Aconcagua towering in the distance, all combined to paint a never-to-be-forgotten picture.

Presently we climbed once more into our train and crept on our way, always hugging the river which at times seemed only a foot or two from the tracks, and which, in places, was, we were told, forty-five kilometers deep. It was midnight when we finally pulled into Mendoza, and bag and baggage left the Trans-Andean Railroad and transferred ourselves to the sleeping cars waiting for us on the Buenos Aires and Pacific road. This is a wide gauge road and runs some three hundred and fifty miles or more in an absolutely straight line, the longest straight track on record. Somewhere there is an "S" in the road, and then it goes on straight again for considerably over four hundred miles. Two fine dining cars, attached to our train, were ready for action upon our arrival, but most of us preferred our sleepers, finding from five thirty A.M. to twelve thirty A.M. quite long enough for one day.

The sleepers were of the continental type, and not uncomfortable. Each room was equipped with a washbasin, electric lights, and an electric fan. The space between the berths and the wall was not more than two feet, and was the only available place for bags; consequently, there was practically no standing room. The sheets and pillows were reasonably clean; but my blanket had recently covered a horse or his rider, and was of the horse—horsey.

The trip across the plains is reputed to be indescribably dusty and hot, but the recent torrential rains had left this region still moist and moderately cool, for which we were devoutly thankful. The country is very flat, somewhat resembling vast stretches of our own western prairies. Sometimes it is barren, with great bunches of pampas grass nodding at one; sometimes there are immense corn and wheat fields; and over and over again we saw herds and herds of cattle—beef enough for the world. There are few villages, and still fewer farm houses, but this may not be remarkable, as the population of all Argentine only averages six to the square mile. All day we rode over this rather monotonous country and grew hot and tired, but never downhearted, there was so much to see and enjoy.

We had been told that we might expect to reach Buenos Aires at about ten o'clock; but by good fortune we made up two hours and arrived at eight. Quite a committee of surgeons, headed by Dr. Vegas and Dr. Pasman, met us, then after submitting to the operations of the omnipresent photographers, we were put into Dr. Vegas' car and driven to the Plaza Hotel. This is a very modern, very up-to-date establishment, where delightful rooms were awaiting us and where we were only too glad to sink down and rest.

VIII. BUENOS AIRES

No matter where or in what manner one has traveled, he must be agreeably surprised by the charm and beauty of the metropolis of South America—a cosmopolitan city, possessing beautiful boulevards, parks, palatial buildings, continental theaters, museums, libraries, art galleries, universities, clubs, and beautiful suburbs in which resides its summer population; but beyond this it has an intangible fascination that one cannot describe; that holds one in thralldom as do some of the famous capitals of Europe.

This city, although founded in about 1530, was not permanently settled until the latter part of the sixteenth century. Its population is now more than a million and a half, and it is so situated that there is ample room for expansion. Its people are independent and proud, and they have a charming manner and a friendliness that makes one admire them, warm to them, and that creates a desire to live among them and to absorb their spirit. While they are a serious people, they possess the desire for pleasure and social intercourse, as testified by their clubs, their pleasure parks, their racetracks, their theaters, and their opera houses. They are scrupulous in the care of their people, as is evidenced by their system of hospitals, which are not excelled by those of any city of the world; also in their educational system, including the early care of their children, their later, higher education, and their well-equipped and well-conducted universities and professional schools of law, medicine, engineering, and theology.

Weeks may be occupied here, in the most luxurious surroundings, in enjoying and becoming acquainted with these great neighbors of ours in the southern portion of this, our twin continent, where the weather is never colder than fifty-one degrees Fahrenheit, nor warmer than eighty degrees.

The Republic of Argentine is about one-third the size of the United States. It became an independent country in 1810, and its Constitution is patterned after the Constitution of the United States.

IX. MONTEVIDEO

Through the port-holes of our state-room on the palatial steamer which conveyed us from Buenos Aires to Montevideo we could see the mountain that was observed four centuries ago by the Portuguese sailor, from whose outcry, as the story goes, the mountain received its name. It appears now a small hill as compared with the City of Montevideo, to which it gives its name; but with its small fortification and flag-staff, it offers its welcome to the stranger.

This peninsula city, with its extensive sanitary docks, resembling those of Panama, is another of the beautiful cities of the world. It is the hub of the proud little country of Uruguay. It is strictly a modern city, with interesting architecture, parks, boulevards, and public buildings of importance and dignity. The city houses a population of sturdy, dignified, business-like people who reliantly meet you face to face. Like the peoples of the other South American countries, they evince no trace of provincialism. They know their Europe and North America, and they are thoroughly cosmopolitan. This country, early in the colonization of its land, was the melting-pot of competing Portuguese, Spanish, and English; and later in its development it waged a struggle for independence against Argentine, Paraguay, and Brazil, the contenders for its attractive acres. Like all of the principal South American countries, it finally emerged from its formative struggles and quietly established its independence in the early part of the nineteenth century, when the mother country, Spain, was busy in its own reconstruction after the long Napoleonic wars.

"No, we are not Spaniards," they will say, with spirit. "We are Uruguayans." "But," the American will reply, "You certainly speak the Spanish language." "Yes, we do speak Spanish; and you, as Americans, speak English. But surely you do not acknowledge that you are English." And so the principal city, of which they are so justly proud, has grown to a metropolis of nearly five hundred thousand inhabitants.

Uruguay, in its Government, is one of the most progressive in the world. In the conduct of its business, it utilizes in the most thrifty manner its great production of live stock, harboring immense packing plants and carrying on an industry of great profit. The country was one of the first to establish the eight-hour working day and recognition of the right of men who labor with their hands to sanitary homes and wholesome working quarters. There is a workman's compensation law.

The educational system of the country provides for and encourages a system of universal education, particularly emphasizing the primary branches. Its university system is comprehensive. Among its departments, under separate faculties, are literature, law, sociology, medicine, pharmacy, commerce, veterinary and other minor subdivisions, each with special laboratory, library, and museum adjuncts.

Uruguay proves its commercial supremacy by the fact that its financial standing is maintained at the highest mark, its unit of currency being based on the gold standard which maintains it at a parity to that of the United States. The Government controls the telegraph and postal systems, and has a rigid banking law.

This is a country of beautiful flowers. The climate is such that roses grow in profusion throughout the year. The mean temperature in the winter months is fifty-two degrees Fahrenheit; spring, sixty-four degrees; summer, seventy-one degrees; and autumn, sixty-one degrees. The mean temperature for eight years, to 1914, was, for Montevideo, sixty-one degrees Fahrenheit, the extreme maximum for that period being ninety-six degrees, and the extreme minimum, thirty-four and one-half. The average rainfall for the year, thirty-nine inches; the average fair, sunshiny days, two hundred and twenty-five per year for eight years. It is no wonder that these fortunate people present to one's view an air of contentment; that they have a spirit of optimism; and that they are industrious and prosperous.

Visit their country as you would visit France or Italy—to enjoy the perfection of climate and the charm of companionship with a cultured people. Go to their sea-ports, attend their operas in their palatial opera houses, learn of their business methods, and in your sojourn you will see many things that will give you food for enjoyment for the long winter evenings of your own wonderful land.

No one can visit our southern continent, if he travels in comfort, and view the mountains, the valleys, the rivers, and the plains of its vast area, know and converse and live with its fascinating people, and experience the thrill of its stimulating and agreeable climate, and not say to himself: "I shall go again."